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CONTENTS OF PREVIOUS NUMBER

APRIL, 1930. NUMBER 4

Anatoxin as an Immunizing Agent Against Diphtheria. G. Ramon, M.D., and G. Illingworth Hélie, M.D., Paris, France.

Comparative Studies of the Influence of Acid-Forming and Base-Forming Diets on the Metabolism of Rats. Emma Louise Samuel, M.S., and I. Newton Kugelmass, M.D., New York.

The Growth and Nitrogen Metabolism of Infants Receiving Undiluted Milk. Martha Van Kirk Nelson, M.S., Iowa City.

Urobilinuria: Its Prognostic Value in Children with Heart Disease. M. H. Edelman, M.D.; L. Halpern, M.A., and J. A. Killian, Ph.D., New York.

Influence of Feeding on Certain Acids in Feces of Infants: IV. The Effect of an Excess of Lactose in Breast Milk and in Whole Cow's Milk on the Excretion of Volatile Acids and of Lactic Acid. Jesse R. Gerstley, M.D.; Chi Che Wang, Ph.D., and Agnes A. Wood, B.S., Chicago.

The Respiratory Metabolism in Infancy and in Childhood: XI. The Respiratory Exchange in Marasmus; Effect of Muscular Activity. James R. Wilson, M.D., Syracuse, N. Y., and Samuel Z. Levine, M.D., and Margaret Kelly, R.N., New York.

Otitis Media and Mastoiditis in Infants Under Three Months of Age. Florence M. Holsclaw, M.D.; Charlotte A. Boehm, M.D., and Jessie M. Bierman, M.D., San Francisco.

Malnutrition: A Study of Preventorium Treatment and of End-Results. Joseph R. Wiseman, M.D., Syracuse, N. Y.

Minimum Requirement of Calcium and Phosphorus in Children. Chi Che Wang, Ph.D.; Ruth Kern, M.S., and Mildred Kaucher, M.S., Chicago.

Asthma in Children: IX. Rôle of Environment in the Treatment of a Selected Group of Cases; a Plea for a "Home" as a Restorative Measure. M. Murray Peshkin, M.D., New York.

Thymic Shadows of New-Born Infants. H. B. Podlasky, M.D., and S. E. Kohn, M.D., Milwaukee.

Case Reports:
- Cavernous Malformation About the Portal Vein Manifested Clinically as a Chronic Thrombosis of the Splenic Vein. S. Van Creveld, M.D., and W. A. Levy, M.D., Amsterdam, Holland.
- Primary Anemia in the New-Born. Clain Fanning Gelston, M.D., and Emmett E. Sappington, M.D., San Francisco.

Progress in Pediatrics:
- Why Parents Consult the Pediatrician. George S. Stevenson, M.D., New York.

Pediatric Biographies:
- William Cadogan. John Ruhräh, M.D., Baltimore.

News and Comment.

Abstracts from Current Literature.

Society Transactions:
- New York Academy of Medicine, Section of Pediatrics.
- Philadelphia Pediatric Society.
- Cleveland Academy of Medicine, Section on Pediatrics.

Book Reviews.

Directory of Pediatric Societies.

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American Journal of Diseases of Children

VOLUME 39 MAY, 1930 NUMBER 5

THE INSENSIBLE PERSPIRATION IN INFANCY AND IN CHILDHOOD

II. PROPOSED BASAL STANDARDS FOR INFANTS *

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AND

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NEW YORK

Preliminary studies [1] demonstrated the constancy of basal measurements of the insensible perspiration in infants by the method of weighing under standard conditions. This demonstration of constancy and the absence of published basal figures led to the present study of a comparatively large and representative group of infants in an attempt to establish basal standards and normal limits of variation for this measurement in these subjects analogous to the well known standards at present available for their basal metabolism.

The composition of insensible perspiration,[2] the apparatus and technic of measurements and the sources of error were fully considered in the previous paper.[1] That study established the reliability of measurements with the balance and showed that with careful technic the experimental error of the method was probably less than 10 per cent.

The standard conditions that gave basal measurements in the previous study were employed in the present investigation. They comprised the following: (1) an environmental temperature between 18.5 and 25 C. (65 and 78 F.); (2) a relative humidity between 25 and 65 per cent;

* Submitted for publication, Dec. 5, 1929.

* From the Department of Pediatrics, Cornell University Medical College and the New York Nursery and Child's Hospital.

* This investigation was supported in part by the committee for the Encouragement of Medical Research.

1. Levine, S. Z.; Wilson, J. R., and Kelly, M.: The Insensible Perspiration in Infancy and in Childhood: I. Its Constancy in Infants under Standard Conditions and the Effect of Various Physiologic Factors, Am. J. Dis. Child. **37**:791 (April) 1929.

2. The term insensible perspiration or the term insensible loss refers to all of the invisible gaseous emanations which leave the body by way of the skin and the respiratory passages. As measured by the method of weighing, its chief component is water vapor (excluding visible perspiration), but it also includes exhaled carbon dioxide less simultaneously absorbed oxygen and traces of other gases. Since water vapor comprises from 85 to 90 per cent of the total insensible loss, many authors use the term insensible perspiration and water of vaporization interchangeably.

(3) a condition of sleep and the absence of all muscular activity; (4) the minimal clothes compatible with comfort, consisting of a thin cotton undershirt, cotton stockings and a nightgown of light weight flannel—the latter was omitted in the observations at the higher temperatures; (5) a small meal given at least one and preferably two hours preceding the observation and containing fewer than 25 calories and weighing less than 40 Gm. per kilogram of body weight; (6) the absence of fluctuations of body (rectal) temperature during the observation, and (7) the absence of visible perspiration. The last factor is of special importance since its presence, even in traces, augments the insensible loss appreciably, and profuse sweating may raise the values three-fold and even four-fold above the basal level.

It is not established that the experimental conditions enumerated necessarily yield absolutely minimal results, but they seemed most suitable for general use, and they had the advantage of closely paralleling the conditions in common use for measuring the basal metabolism of infants.

SUBJECTS

The insensible perspiration of 110 infants was determined in 125 "basal" observations of from one to three hours' duration by the method of weighing. Forty-eight of the subjects were colored (44 per cent); sixty-seven were boys (63 per cent). They were all afebrile and free from acute infections during observations. Their ages ranged from 9 days to 25 months and their weight, from 12 per cent above to 55 per cent below the average weight for age.

The subjects were arbitrarily divided into three groups on the basis of their nutritional condition. Those who were less than 20 per cent underweight for age were considered normal; those between 21 and 35 per cent underweight, malnourished, and those 36 per cent or more underweight, marasmic. The figures of 20 and 35 per cent were chosen to differentiate the subjects, since previous work [3] showed that alterations of the basal metabolic rate per true and per expected weight become evident when the degree of malnutrition approximates these respective figures. The number of observations on the three groups of subjects [4] at different ages is recorded in table 1.

RESULTS

The basal results reported herein are averages of the minimal figures of at least two, and usually more, experimental periods of from twenty-five to thirty minutes' duration. The scatter of results for

3. Levine, S. Z.; Wilson, J. R., and Gottschall, G.: The Respiratory Metabolism in Infancy and in Childhood: VIII. The Respiratory Exchange in Marasmus: Basal Metabolism, Am. J. Dis. Child. **35**:615 (April) 1928.

4. Personal histories of subjects and detailed data of experiments are omitted to save space.

individual periods invariably fell within the experimental error of the method, maximal deviations from the mean for entire observations rarely exceeding 15 per cent and usually being less than 10 per cent. Additional evidence of the reliability of measurements is afforded by the consistent results secured in duplicate experiments on different days.

The results were analyzed on the basis of age, weight, height and surface area in accordance with the customary method of tabulating physiologic data, and tables and curves of correlation between the basal insensible perspiration and these measurements are presented. A preliminary analysis of the data on the basis of sex, race and color established the negligible influence of these factors on the basal insensible loss within the age range studied. For this reason, no differentiation

TABLE 1.—*Number of Observations on Infants of Different Ages and in Varying States of Nutrition* *

Age in Months	Normal, Less than 20% Underweight	Malnourished, 20 to 35% Underweight	Marasmic, 36% or More Underweight	Total
0	13	0	1	14
1	6	10	1	17
2	2	9	1	12
3	2	1	17	20
4	2	3	3	8
5	6	2	0	8
6	1	3	1	5
7	4	2	0	6
8	3	3	1	7
9	3	1	1	5
10	2	0	1	3
11	1	1	1	3
12	4	0	1	5
13 and older	9	3	0	12
Total	58	38	29	125

* The state of nutrition was estimated from the Woodbury tables, page 106 (U. S. Dept. of Labor, Children's Bureau, pub. 87, 1921).

is made in the charts and tables between white and colored and between male and female subjects. The trivial influence of these factors is in marked contrast to the notable effect of age and of the state of nutrition on this measurement. The results obtained in marasmic subjects appear on all of the charts, but they were not used in the construction of the curves of correlation. The latter were plotted as smoothed curves according to standard statistical methods from the points representing observations on infants in good and fair nutrition (infants less than 35 per cent underweight for age).

Age and Insensible Perspiration.—Chart 1 presents the correlation between the age in months and the basal insensible perspiration in grams per hour.

The basal rate of insensible loss rises steadily with increasing age during the first year. The smoothed curve in this age period takes the form of a straight line, the slope of which is appreciably steeper

than that of the projected curve for older infants. The relatively few observations used in the construction of the latter portion of the curve (in broken lines) require additional data for confirmation, but it is significant that the slope of the entire curve parallels the curve of basal metabolism referred to age constructed from the figures reported by Benedict and Talbot [5] for infants of similar age to our series.[6] The scatter of points is not excessive when one considers that infants in all stages of nutrition are represented in the chart. Only 13 out of the 125 points representing all observations deviate from the curve as laid out by more than 20 per cent, and only 28 exceed a deviation of 15 per cent.

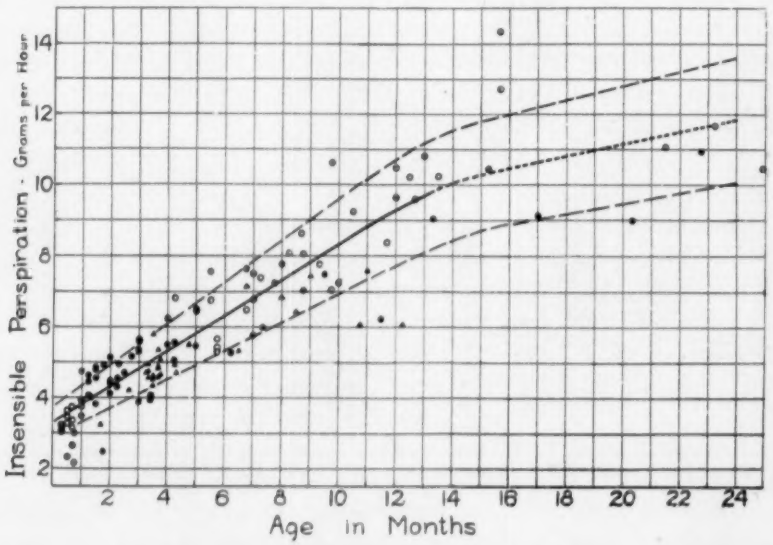

Chart 1.—The basal insensible perspiration of infants in grams per hour referred to age in months. The smoothed curve shows the trend with increasing age. The dash lines indicate a deviation of ± 15 per cent from the curve as laid out. The circles represent infants 20 per cent or less underweight for age; the dots, infants between 21 and 35 per cent underweight, and the triangles, infants 36 per cent or more underweight.

Body Weight and Insensible Perspiration.—In chart 2, the basal insensible loss in grams per hour is referred to body weight in kilograms.

The rise in insensible perspiration is proportional to the increase of body weight. The smoothed curve best fitting the points also assumes

5. Benedict, F. G., and Talbot, F. B.: Metabolism and Growth from Birth to Puberty, Carnegie Institution of Washington, no. 302, 1921, tables 27 and 28.

6. The latter curve will be shown in paper III of the present series, which will appear in a later issue.

the form of a straight line up to a weight of approximately 9 Kg. (equivalent to the weight of a child about 1 year of age). Beyond this weight, the slope of the curve rises slightly. The accentuated slope in the latter region indicates that the average increment of increase per kilogram of body weight is somewhat greater in infants who are 1 year of age and older than in younger subjects. The chart also shows that marasmic infants in general maintain a higher basal rate than do well nourished subjects. The effect of age and nutrition will be more fully considered later (tables 2 and 3). The scatter of points is relatively slight. Of the ninety-six observations on subjects who are 35 or less

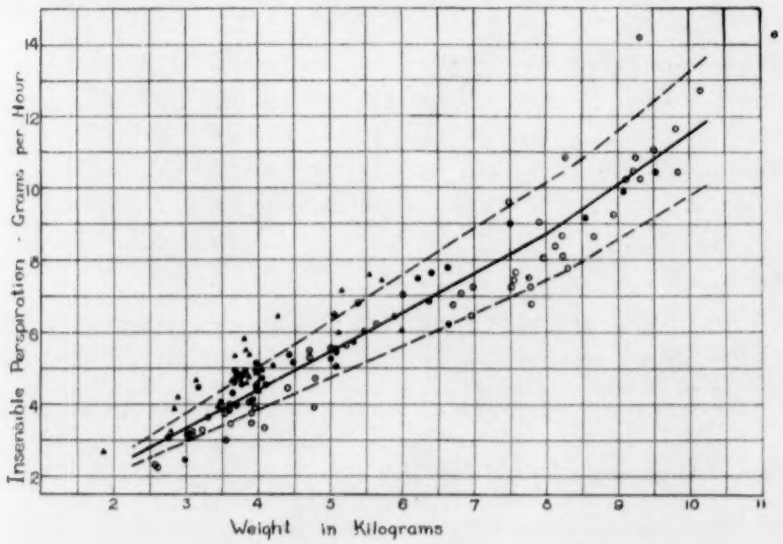

Chart 2.—The basal insensible perspiration of infants in grams per hour referred to body weight in kilograms.

per cent underweight for age, only fourteen deviate from the curve as laid out by more than ± 15 per cent.

The dissimilar appearance of the curves of age (chart 1) and of weight (chart 2), especially in the regions encompassing older and heavier subjects, respectively, suggests that age and the state of nutrition play specific rôles in the regulation of the basal insensible perspiration of infants. Evidence that supports this view appears in table 2.

This table shows that with few exceptions, heavier infants (vertical columns) and older infants (horizontal columns) maintain a higher rate of basal insensible loss than more emaciated and younger subjects of corresponding age and weight. The differences are sufficiently consistent and striking to assign independent rôles to age and nutrition in the

regulatory mechanism of insensible loss. Metabolic studies on infants have shown that within this age period these two factors serve also to control the basal metabolic rate.[5]

The results per kilogram of body weight are summarized in table 3 and in chart 3. The infants are grouped according to age and nutrition, and the latter is expressed as heretofore in terms of percentage under-

TABLE 2.—*The Relation of Age and the Condition of Nutrition to the Basal Insensible Perspiration of Infants* *

	Age												
Weight Kg.	Less than 1 Mo.	1 Mo.	2 Mo.	3 Mo.	4 Mo.	5 Mo.	6 Mo.	7 Mo.	8 Mo.	9 Mo.	10 Mo.	11 Mo.	12 and Older
2.1- 3.0.....	2.55 (4)	2.87 (2)	4.20 (1)	3.88 (1)									
3.1- 4.0.....	3.30 (9)	4.16 (13)	4.31 (6)	4.79 (14)	5.20 (2)								
4.1- 5.0.....	3.35 (1)	4.33 (1)	4.75 (6)	5.13 (3)	4.94 (1)	6.14 (3)	5.92 (3)	....	6.43 (1)				
5.1- 6.0.....	....	....	....	5.62 (2)	6.13 (3)	7.17 (2)	....	5.89 (2)	7.03 (1)	7.44 (1)	6.05 (1)	7.59 (1)	6.06 (1)
6.1- 7.0.....	....	....	....	....	....	....	7.07 (2)	7.26 (1)	7.33 (2)	7.28 (2)	....	6.21 (1)	....
7.1- 8.0.....	....	....	....	....	....	7.43 (3)	....	7.23 (3)	8.04 (1)	....	7.25 (1)	....	9.21 (3)
8.1- 9.0.....	....	....	....	....	....	....	....	....	8.37 (2)	7.77 (1)	9.23 (1)	8.39 (1)	9.87 (3)
9.1-10.0.....	....	....	....	....	....	....	....	....	....	10.82 (1)	....	....	10.69 (8)
10.1-11.0.....	....	....	....	....	....	....	....	....	....	....	....	....	12.72 (1)
11.1-12.0.....	....	....	....	....	....	....	....	....	....	....	....	....	14.33 (1)

* The figures in parenthesis indicate the number of observations in each group.

TABLE 3.—*Summary of Basal Insensible Perspiration in Grams Per Kilogram of Body Weight Per Hour*

Subjects*	No. of Observations	Mean	Average Deviation	Per Cent	Standard Deviation	Per Cent	Probable Error	Per Cent
Normal, less than 1 year.....	40	1.00	±0.07	6.9	0.086	8.6	0.068	6.8
Malnourished, less than 1 year	33	1.17	±0.09	6.8	0.106	9.1	0.071	6.1
Marasmic, less than 1 year.....	28	1.32	±0.12	7.6	0.128	9.7	0.095	7.2
All infants 1 year and older....	16	1.15	±0.06	5.2	0.075	6.6	0.051	4.4

* Normal infants indicate those less than 20 per cent underweight for age; malnourished, those between 20 and 35 per cent underweight, and marasmic, those 36 per cent or more underweight.

weight for age. The table gives the average results; the chart gives the results for individual subjects.

Normal infants less than 1 year of age maintain an average basal rate of loss of 1 Gm. per kilogram per hour (average deviation ± 0.07); malnourished infants, 1.17 Gm. per kilogram (average deviation ± 0.09); and marasmic infants, 1.32 Gm. per kilogram (average deviation ± 0.12). The average and standard deviations from the mean

for all groups of observations fall well within 10 per cent (table 3). Since differences of the average figures for the three groups are consistent and exceed the average deviations, they may be considered significant. Above 1 year of age, the influence of the nutritional condition on the basal insensible loss is not so evident, the average basal figures for thirteen infants in good nutrition and for three infants in fair nutrition being the same—1.15 Gm. per kilogram (average deviation ± 0.06). The latter results are mentioned but not emphasized until additional data are available. It is, however, of interest to note that the somewhat higher rate of insensible loss of the infants 1 year of age and older corresponds with the relatively higher basal metabolic rate obtained within this period of age by all workers. It is also note-

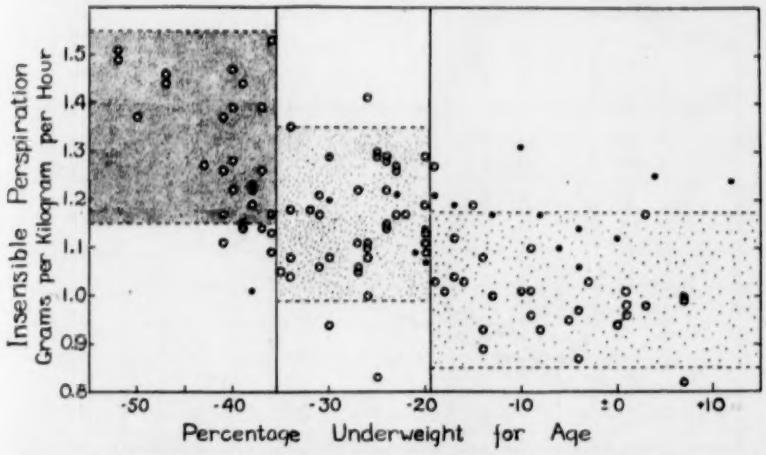

Chart 3.—The basal insensible perspiration of infants in grams per kilogram per hour referred to the state of nutrition. The areas within the dash lines indicate deviations of less than ± 15 per cent from the mean figures for the respective groups of subjects. The circles represent infants less than 1 year of age; the dots, older infants.

worthy that the basal figure of 1 Gm. per kilogram obtained in normal infants exactly doubles the basal value of 0.5 Gm. per kilogram for the insensible loss of normal adults reported by Benedict and Root [7] and more recently by Miles,[8] and that the relationship of this measurement in infants and in adults is precisely that which exists for basal metabolism in these subjects.

7. Benedict, F. G., and Root, H. F.: Insensible Perspiration: Its Relation to Human Physiology and Pathology, Arch. Int. Med. **28**:1 (July) 1926.

8. Miles, W. R.: Duration of Sleep and the Insensible Perspiration, Proc. Soc. Exper. Biol. & Med. **26**:577 (April 17) 1929.

Not only are the average deviations from the mean for each group of observations slight, but individual variations are also comparatively minor. The scatter of points in chart 3 is not excessive, and only a few fall outside of a range of ± 15 per cent from the mean for each group. In addition, more than 90 per cent of the individual values in each of the three groups of observations fell within the limits of the mean ± twice the respective probable errors.

Until further observations are available, it would seem justifiable to offer the aforementioned figures as tentative standards on the basis of weight for the basal insensible perspiration of infants in different stages of nutrition.

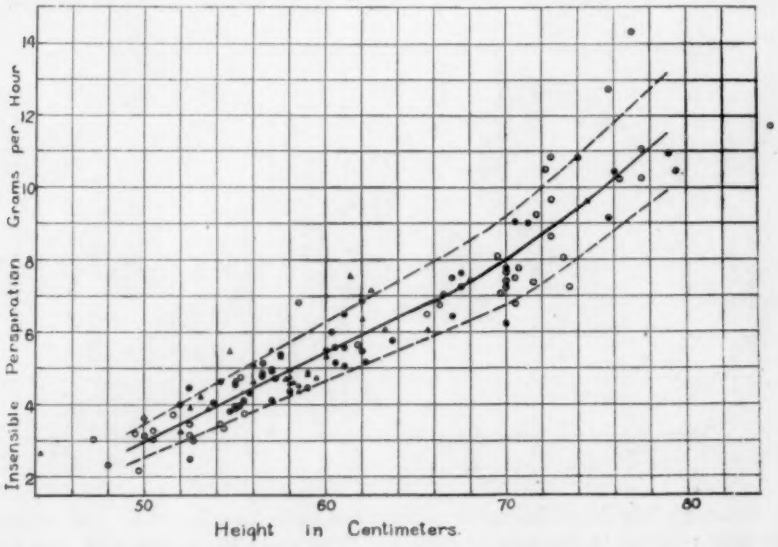

Chart 4.—The basal insensible perspiration of infants in grams per hour referred to body height in centimeters.

Body Height and Insensible Perspiration.—In chart 4, the basal insensible perspiration in grams per hour is referred to body height in centimeters. The basal rate rises progressively with increase in body stature, and the curve of correlation as drawn closely resembles the weight curve (chart 2). The accentuation of the slope of the curve in the region of the taller infants is slight but definite. Only 19 of the 125 points exceed a deviation of ± 15 per cent.

The state of nutrition does not apparently influence the basal insensible loss referred to height because some marasmic infants lose more and others less than do well nourished infants of corresponding stature. The influence of age on this measurement per unit of height is, on the other hand, obvious (table 4).

Table 4 shows that the basal rate of insensible loss per cubic centimeter per twenty-four hours rises steadily with increasing age regardless of the nutritional condition and that subjects one year and older maintain a basal rate which exceeds by two-fold the rate of infants under 2 months of age. Differences in the figures for the groups of various ages are probably significant since they are consistent and usually exceed the average deviations from the mean for the respective groups. A more precise subdivision of age periods presented in this table seemed inadvisable until further study. It is certain, however, from the gradual and steady rise of the figures from birth to the upper age limit studied, that segregation of the subjects on a monthly age basis would probably reduce the variations and increase the reliability of the results.

The evidence thus far presented indicates that age, weight and body stature play independent and specific although interrelated rôles in the regulation of the basal insensible perspiration of infants. Evidence is

TABLE 4.—*Summary of Basal Insensible Perspiration in Grams Per Centimeter of Body Height Per Twenty-Four Hours*

Age in Months	No. of Observations	Mean	Average Deviation	Per Cent	Standard Deviation	Per Cent	Probable Error	Per Cent
Birth to 2	29	1.64	±0.18	10.9	0.22	13.4	0.15	9.1
2 to 4	33	2.02	±0.15	7.4	0.17	8.4	0.12	5.9
5 to 8	22	2.48	±0.20	8.0	0.24	9.6	0.16	6.5
9 to 11	10	2.61	±0.24	9.1	0.30	11.4	0.20	7.6
12 and older	15	3.29	±0.19	5.7	0.27	8.2	0.18	5.5

at hand which proves that the mechanism of basal metabolism is under similar control of the aforementioned factors.[5]

Surface Area and Insensible Perspiration.—In chart 5, the basal insensible perspiration in grams per hour is referred to surface area in square meters. As estimated, the latter measurement combines the two factors, body weight and body stature.[9]

The correlation between the two measurements is good, and the smoothed curve as laid out resembles closely the curves of weight and height (charts 2 and 4). It shows the same accentuation of the slope in the region of the larger infants as in the previous curves. The scatter of points is compact, and only 10 of the 96 points representing observations on subjects 35 or less per cent underweight for age exceed a deviation of ± 15 per cent. The emaciated infants in general maintain a higher basal rate than the well nourished subjects, but the variations are not striking, and it seemed permissible, until additional data will

9. Nomogram by R. R. Hannon for estimating surface area of children according to the formula of Du Bois and Du Bois, in Du Bois, E. F.: Basal Metabolism in Health and Disease, ed. 2, Philadelphia, Lea & Febiger, 1927, p. 124.

permit of a finer segregation of subjects on a nutritional basis, to average the results obtained on all subjects (table 5).

The figures presented in table 5 are offered as tentative standards on the basis of surface area for the basal insensible perspiration of infants up to 2 years of age and in all stages of nutrition. Infants less than 2 months of age maintain a basal rate of 17 Gm. of insensible perspiration per square meter per hour (average deviation ± 1.6); infants between 2 and 12 months of age, 20.5 Gm. per square meter (average deviation ±1.4); and those 1 year and older, 24.7 Gm. per square meter (average deviation ± 1.2). Average deviations are less than the differences between the mean values for each group of

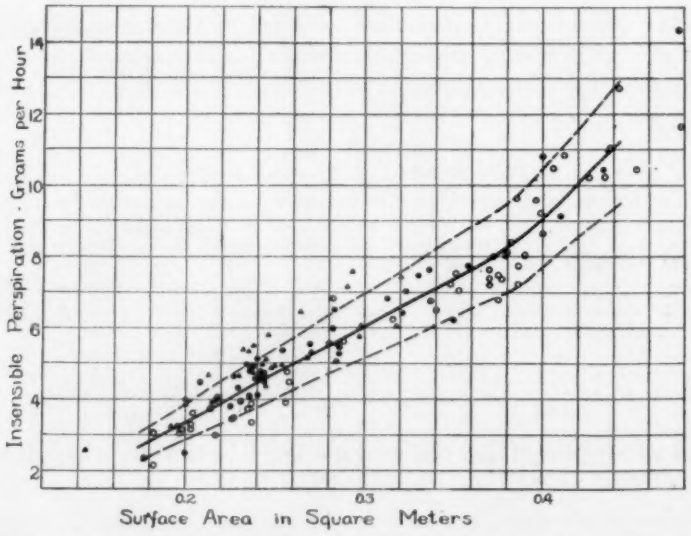

Chart 5.—The basal insensible perspiration of infants in grams per hour referred to surface area in square meters.

TABLE 5.—*Summary of Basal Insensible Perspiration in Grams Per Square Meter of Body Surface Per Hour*

Age in Months	No. of Observations	Mean	Average Deviation	Per Cent	Standard Deviation	Per Cent	Probable Error	Per Cent
0 to 2	29	17.0	±1.6	9.3	2.0	12.0	1.38	8.1
2 to 12	71	20.5	±1.4	6.8	1.6	8.0	1.10	5.4
12 and older	15	24.7	±1.2	4.9	1.6	6.4	1.06	4.3

observations and are well under 10 per cent. The results may, therefore, be considered significant. The small magnitude of the standard deviations and of the probable errors for each group also serves to confirm the significance of the reported mean results. More than 80 per cent of the values in each age group fell within the range of the mean ± twice the probable error.

As a check on the validity of compiling the results on all subjects of corresponding age but in varying stages of nutrition in one total average, the subjects were classified as heretofore in three groups on the basis of their nutritional status, and the average results for each group were computed. This method of calculation did not alter the average basal figures appreciably; for example, the nineteen well nourished infants between 2 and 12 months of age averaged 20.2 Gm. of insensible loss per square meter per hour; the 22 malnourished subjects, 20.3 Gm. per square meter; and the 21 marasmic subjects, 21 Gm. per square meter. Calculation of the results of younger and older subjects by the same method yielded differences of approximately similar but slightly greater magnitude. It therefore seems justifiable to accept the figures, but to emphasize the possibility that the accumulation of additional data on strictly normal infants may lower the proposed standards on the basis of surface area to a somewhat lower level.

COMMENT

Experimental evidence has been presented which indicates that the physiologic mechanism of basal insensible perspiration is under as rigid control, within the infantile organism, as the mechanism of basal metabolism. This inference is in accord with theoretic expectation since the principle function of insensible perspiration is probably the dissipation of heat from the body by way of vaporization of water through the skin and respiratory passages. Previous work[10] has demonstrated that the proportion of loss of heat in vaporization through these channels is constant and that it approximates 25 per cent of the total loss of heat (or of heat production).[11]

10. Soderstrom, G. F., and Du Bois, E. F.: Clinical Calorimetry: XXV. The Water Elimination Through Skin and Respiratory Passages in Health and Disease, Arch. Int. Med. **19**:931 (May) 1917. Levine, S. Z., and Wilson, J. R.: Respiratory Metabolism in Infancy and in Childhood: IV. Elimination of Water through the Skin and Respiratory Passages of Children, Am. J. Dis. Child. **33**: 204 (Feb.) 1927; Respiratory Metabolism in Infancy and in Childhood: VII. Elimination of Water through the Skin and Respiratory Passages of Infants, Am. J. Dis. Child **35**:54 (Jan.) 1928.

11. In passing, it may be of interest to compare the estimated basal insensible loss computed from the respiratory exchange of infants with the basal results actually obtained with the balance. The former may be calculated as follows: The generally accepted standards for the basal metabolism of normal infants less than 1 and between 1 and 2 years of age are 50 and 56 calories per kilogram per twenty-four hours (± 10 per cent), respectively.[8] The average daily loss of heat in vaporization of water through the skin and lungs may therefore be estimated to be 13 for the younger and 14.56 calories per kilogram for the older subjects (Levine and Wilson: Am. J. Dis. Child. **35**:54 (Jan.) 1928). These figures are equivalent to 22.2 and 24.9 Gm. of moisture vapor-

The demonstration of constancy of the basal insensible perspiration of infants and the establishment of normal standards is of considerable physiologic and clinical importance. An attempt has already been made to predict the metabolism of adults [7] and of infants [12] from the insensible perspiration as measured by the relatively simple method of weighing. If proved reliable, this procedure will be especially valuable in infants since measurements of the basal metabolism in these subjects are time-consuming and technically difficult. This phase of the subject will be considered in greater detail in the next paper.[13]

In addition, the introduction of normal standards for this measurement in infants will enable studies of pathologic variations in diseases associated with a probable derangement of the water metabolism. Such conditions are particularly frequent in the infantile organism and include hydrolability (exudative diathesis), nutritional and cardiac edema, dehydration resulting from alimentary intoxication or inanition fever, and others. Measurements of the basal insensible perspiration in these conditions are now in progress and will be reported at a later date.

As previously mentioned, the proposed standards are tentative. Further refinement in technic and additional data which will permit of a more precise segregation of subjects on the basis of age and of nutrition may possibly change the proposed basal figures to some extent. Mathematical analysis, however, would seem to justify the conclusion that the reported results are reliable and within the limits of the experimental error of the method.

---

ized daily by the two groups of subjects—the latent heat of vaporization of 1 Gm. of water at 24 C. being 0.584 calories. To these figures for water vapor must be added the difference between exhaled carbon dioxide and consumed oxygen to compute the total insensible loss (weight of carbon).[8] At a respiratory quotient of 0.85, which is the average value obtained in these subjects under basal conditions, the weight of carbon comprises 10 per cent of the total loss of weight. The insensible loss as calculated averages, therefore, 24.4 Gm. per kilogram per twenty-four hours, or 1.02 Gm. per kilogram per hour for the infants less than 1 year of age and 27.4 Gm. per kilogram per twenty-four hours or 1.14 Gm. per kilogram per hour for the older infants. Although this method of calculation is admittedly an approximation, the similarity between these figures and those actually obtained with the balance as reported herein is striking. The latter averaged 1 and 1.15 Gm. per kilogram per hour for the younger and older infants, respectively. The close agreement between the estimated and the actually obtained figures confirms the reliability of measurements with the balance.

12. Levine, S. Z.; Wilson, J. R., and Kelly, M.: Prediction of the Basal Metabolism of Infants from the Measured Insensible Perspiration, Proc. Soc. Exper. Biol. & Med. **25**:554, 1928.

13. Levine, S. Z., and Marples, E.: The Insensible Perspiration in Infancy and in Childhood: III. Basal Metabolism and Basal Insensible Perspiration of the Normal Infant: A Statistical Study of Reliability and of Correlation, to be published in a later issue.

SUMMARY AND CONCLUSIONS

The importance of establishing basal standards for the basal insensible perspiration of infants has been briefly considered.

The basal insensible perspiration of 110 infants in varying stages of nutrition and ranging in age from 9 days to 25 months was determined in 125 observations of from one to three hours' duration by the method of weighing. The subjects were all afebrile and free from acute infections during observations. The consistent results have led to the introduction of tentative standards and normal limits of variation for this measurement in infants on the basis of age, weight, height and surface area, analogous to the well known standards at present available for basal metabolism.

161 West Sixty-First Street.

ANTIRACHITIC EFFECT OF WINTER SUNSHINE THROUGH CELOGLASS

RESULTS OF EXPERIMENTATION ON RATS *

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In attempting to estimate further the effectiveness of Celoglass by experimentation on rats, we utilized the general plan reported by Tisdall and Brown.[1]

METHOD

Every two weeks we secured twenty-five albino rats weighing between 30 and 40 Gm. These were placed at once on McCollum's rachitogenic diet 3143, and then separated into two groups. One group was put immediately in the solarium in cages within 1 foot of the Celoglass window, and the other kept in the room for rats amply guarded from possible exposure to ultraviolet rays. At the end of six weeks both groups of rats were killed by decapitation, and the blood collected and defibrinated. The inorganic phosphate was estimated at once by the method of Fiske and Subbarrow,[2] and roentgenograms were taken. Following this, the percentage of ash in the bones was determined by the method of Bethke, Steenbock and Nelson,[3] as outlined by Tisdall and Brown.

By means of the aforementioned procedure, we felt that we could form an opinion as to the prophylactic value of winter sunshine in Boston through Celoglass, as applied to the rickets of rats. In addition, in some cases we tested the curative value of the same agent in rats already rendered rachitic.

Our experiments differed from those of Tisdall and Brown in certain particulars, as follows:

1. Rats were exposed (as were the children) throughout the day, instead of for two hours at noon.

2. Our animals were killed after six weeks instead of after four weeks.

3. Our experiment was begun in January, 1928, and concluded in February, 1929, with the omission of the months of May to October, inclusive.

4. Certain gaps occurred in our series due to deaths from an epidemic among some of the control animals and to deaths from the heat in some of the exposed rats. As is obvious, also, we did not use as many rats as did the authors quoted herein.

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* Submitted for publication, Dec. 2, 1929.

* From the Infants' and Children's Hospital, and the Pediatric Departments, Harvard Medical School, Boston.

1. Tisdall, F. F., and Brown, A.: Seasonal Variation of Antirachitic Effects of Sunshine, Am. J. Dis. Child. **34**:721 (Nov.) 1927.

2. Fiske, C. H., and Subbarrow, Y.: J. Biol. Chem. **66**:375, 1926.

3. Bethke, R. M.; Steenbock, H., and Nelson, M. T.: Fat-Soluble Vitamins Calcium and Phosphorus Relations to Growth and Composition of Blood and Bone with Varying Vitamin Intake, J. Biol. Chem. **58**:71, 1923.

RESULTS

In table 1 and chart 1 are summarized results that cover the winter months. The average bone ash percentage of the rats exposed in the solarium was nearly twice that of the control animals, and the same may be said for the inorganic phosphate of the blood. In addition, roentgenograms demonstrated that the exposed animals were all free from rickets, whereas the control rats showed marked rickets.

The only exceptional measurement contained in table 1 is the value for the bone ash of 33.3 per cent obtained on the group of exposed animals killed on Dec. 30, 1928. This low figure reduces the general average to 52.2 per cent instead of to 55 per cent, if we omit it, and we cannot but feel that there might have been an error in the determination or in the labeling of specimens.

In addition, mention should be made of one group early in the experiment which is not included in table 1 because the animals were exposed for only four weeks instead of six. This group was in the solarium from January 27 to February 23, and when the animals were killed roentgenograms showed evidence of slight rickets together with an inorganic blood phosphate of 3.7 mg. per hundred cubic centimeters, and a bone ash percentage of 46. Controls kept in the dark had about the same degree of rickets and a blood phosphate likewise of 3.7, the bone ash percentage being 43. Although one hesitates to compare this group with the others, it possibly suggests that during February there was slight if any protection against rickets as judged by these particular young rats. Since evidence already presented shows that infants became tanned and their rickets began definitely to heal during February, the question arises as to whether rats are not less sensitive to the beneficial effects of ultraviolet light than are children. In our experiment, the rats were much nearer the source of light than were the children.

In table 2 are given a few instances of comparison between control rats with rickets and rats of the same groups which were placed in the solarium after being rendered rachitic during four or six weeks in the dark.

The first group suggests that a certain amount of healing occurred as a result of sunlight during the last week in February and the first week in March. A similar effect is observable during two weeks in the middle of March and a much greater effect in the two weeks prior to April 6. Possibly one may infer from this a great increase in effective rays, such as Tisdall and Brown observed, commencing late in March.

In order to illustrate in a slightly different manner the progressive decrease in bone ash of rats placed on a rachitogenic diet at 4 weeks of age together with the increases that occur following exposure to ultra-

TABLE 1.—*Results Covering Winter Months* *

Date Killed	Bone Ash, Percentage		Inorganic Blood Phosphates	
	Exposed Rats	Control Rats	Exposed Rats	Control Rats
Dec. 17, 1928.....	54.8	Died	7.5†	Died
Dec. 30, 1928.....	33.3	Died	5.5‡	Died
Feb. 1, 1929.....	53.7	26.2	5.0‡	3.1‡
	56.5	....	....	....
Feb. 12, 1928.....	59.0	....	8.4†	....
March 7, 1928.....	....	35.0	....	3.3
March 22, 1928.....	52.0	30.5	5.0	2.4
April 6, 1928.....	53.0	Died	4.7	Died
April 21, 1928.....	55.0	32.0	4.4	2.8
Average	52.2	30.9	4.7	2.9

* All rats were on McCollum's diet 3143.

† The determinations were high because of hemolysis, and therefore not included in the averages. These determinations were also made on plasma (other values being on whole blood).

‡ These determinations were made on plasma (other values being on whole blood).

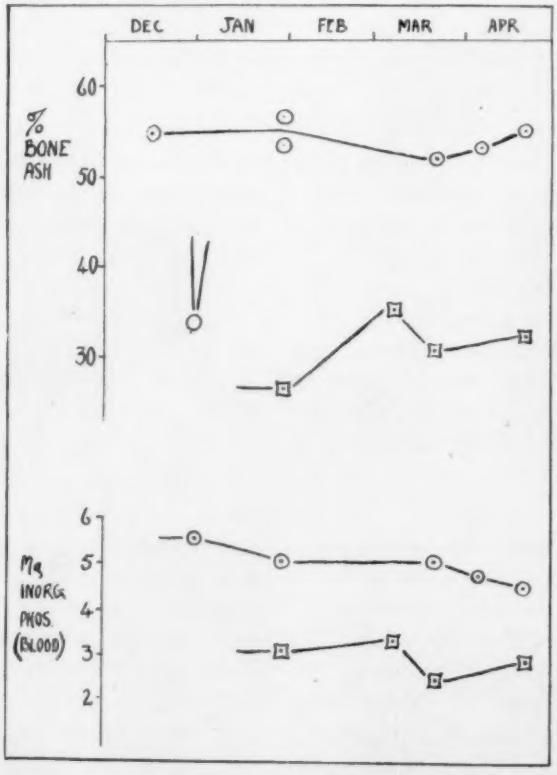

Chart 1.—The circles represent values obtained from albino rats killed after six weeks in the Celoglass solarium, showing protection against rickets. The squares give control figures on groups kept for a similar period in the dark, showing marked rickets. In both instances the rats were fed McCollum's rachitogenic diet 3143, and the condition of the bones was confirmed by roentgenograms.

TABLE 2.—*Comparison Between Rats with Rickets and Those Placed in the Solarium* *

Date	Group	Bone Ash, Percentage	Inorganic Blood Phosphate	X-Ray Observations
Jan. 25-March 7..	1 (6 wks. in dark).....	35.0	3.3	Rickets
Jan. 25-March 7..	2 (4 wks in dark, 2 wks. in sun)....	46.0	4.1	Healed
Jan. 25-March 22.	3 (8 wks. in dark).....	21.3	2.4	Rickets
Jan. 25-March 22.	4 (6 wks. in dark, 2 wks in sun)....	36.0	2.6	Healed
Jan. 25-March 22.	5 (4 wks. in dark, 4 wks. in sun)....	42.0	4.0	Healed
Feb. 10-April 6...	6 (8 wks. in dark).....	26.0	2.5	Rickets
Feb. 10-April 6...	7 (6 wks. in dark, 2 wks. in sun)...	53.0	4.5	Healed

* All rats were on McCollum's diet 3143.

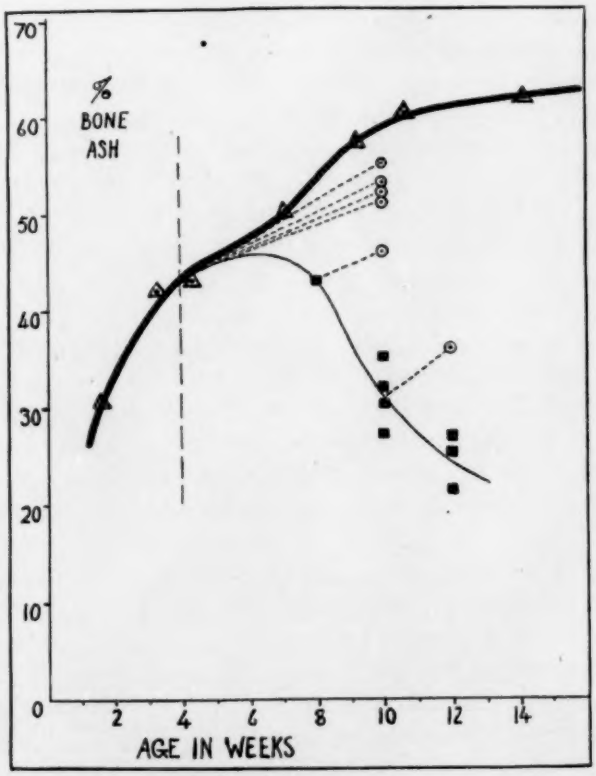

Chart 2.—The square dots represent rachitic values of different degrees of severity. The circles represent comparative effects of exposure to sunshine through Celoglass during all or part of the period during which the rachitogenic diet was given. Rachitogenic diet 3143 was commenced at 4 weeks of age. Note: The heavy line passing through triangles represents for comparison values for rats on normal control diet estimated from data published by F. S. Hammett,[4] with the exception of the first determination, which was made by ourselves.

4. Hammett, F. S.: Biochemical Study of Bone Growth; Changes in Ash, Organic Matter and Water During Growth (Mus Novegias Albinus), J. Biol. Chem. **64**:409, 1925.

violet rays, chart 2 was constructed. Along the light line fall the values of 43 per cent for rats four weeks on diet 3143, 35 per cent, 32 per cent, 30.5 per cent and 26.2 per cent for rats six weeks on the diet, and 26.2 per cent, 26 per cent and 21.3 per cent for rats kept on the diet for eight weeks. The circles represent the effect of sunlight (in the solarium) commenced at the point from which the dotted lines originate, and contrasting with the rachitic values vertically below them, through which the light line passes.

COMMENT

Additional evidence is supplied by experimentation on rats to substantiate the data contained in the earlier portion of this paper regarding the effectiveness of winter sunlight in Boston in the prevention and cure of rickets. Aside from a possibility that the sun's rays are least effective in February, and that a marked increase occurs at the end of March, we do not venture to suggest that quantitative differences have been observed. Undoubtedly, with more detailed experiments the relative antirachitic potency of sunshine in each of the winter months could be plotted.

UNDERWEIGHT CHILDREN

INCREASED GROWTH SECURED THROUGH THE USE OF WHEAT GERM *

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It was customary until recent years for those concerned with problems of human nutrition to assume that vitamin B was widely distributed in natural foodstuffs and that any reasonably well constructed diet was likely to contain enough of that vitamin. These assumptions were based on the older assays of food for what is now termed the vitamin B complex, which has recently been shown definitely to consist of at least two vitamins. Some lack of uniformity still exists with regard to the method of naming these vitamins, but little doubt obtains as to their character and general distribution. The antineuritic substance which is still generally termed vitamin B is the more thermolabile of the two, and the antipellagric substance, the separate existence of which was demonstrated by Goldberger and his associates and which is now called vitamin G, is fairly thermostable. The history of the separation of these two factors need not be repeated here, since it is so recent and so widely discussed as to be familiar to all interested in these problems. A recent painstaking review by Kruse and McCollum [1] covers the ground excellently.

An interesting outgrowth of this separation, however, is its practical application to modern human feeding problems, particularly to the feeding of children. The older accepted distribution in foods of so-called vitamin B is now displaced by a much less well known and less completely determined distribution of the two vitamins, antineuritic B and antipellagric G. Criticism of the modern American diet must therefore now include at least one new criterion.

It is clear from recent estimates, for example that of the Food Research Institute,[2] that the tendency in this country is toward an increase in the use of milk, sugar, fruits and vegetables and possibly

* Submitted for publication, Dec. 5, 1929.

* From the Laboratory of Household Science, the University of California.

1. Kruse, H. D., and McCollum, E. V.: Biochemical Investigation of Vitamin B, Physiol. Rev. **9**:126, 1929.

2. The Decline in Per Capita Consumption of Flour in the United States, Wheat Studies of the Food Research Institute, 1926, vol. 2, no. 8.

a decrease in the use of meats and cereals. Actual figures, however, for the per capita consumption of fruits and vegetables are not available, and the changes in meat consumption appear negligible. The downward trend, however, in the use of cereals, from 5.5 bushels of wheat per capita in 1890 to 4.4 in 1925, is unmistakable; it is connected no doubt with the corresponding upward swing of sugar consumption, from 50 to 112 pounds per capita during the same period.

This change in food habits of the American people has in general been looked on as physiologically good or at least as not injurious, because the supposed increase in the use of milk, fruits and vegetables was thought to overbalance any nutritive loss involved in the substitution of sugar for cereals, and particularly for wheat products. For example, Taylor [3] made the following statement: "The expansion in the use of sugar has been in part associated with expansion of the use of fruits and vegetables. The protein, vitamins and minerals in the cereals displaced by sugar have been in part replaced by the protein, vitamins and minerals in fruits and vegetables. The net effect is not measurable, but there can be little doubt that the level of competency in intake of protein, vitamins and minerals has improved during the last fifty years." The comment may be made that there is only a supposition that the consumption of fruits and vegetables has increased, and that if it has, the protein content of the average succulent vegetables and fruits is practically negligible as compared with that of cereals, and as will be shown here the vitamin B of cereals cannot be replaced by the minute amount of vitamin B in vegetables and fruits.

THE DECREASING CONTENT OF VITAMIN B IN THE MODERN DIET

Such studies of distribution of vitamins B and G in foods as have been reported indicate that vitamin B is relatively abundant in cereals, particularly in the germ, and scarce in milk, meat, fruits and vegetables. Vitamin G, on the other hand, is widely distributed in the latter foods, but is scarce in cereals. This statement is based on the work of Hauge and Carrick [4] on corn, Sherman and Axtmayer [5] on milk and wheat, Hunt and Krauss [6] on milk, Aykroyd and Roscoe [7] on meat, yeast,

3. A. E. Taylor: The Place of Wheat in the Diet, Wheat Studies of the Food Research Institute, 1929, vol. 5, no. 4.

4. Hauge, S. M., and Carrick, C. W.: A Differentiation Between the Water Soluble Growth-Promoting and Antineuritic Substances, J. Biol. Chem. **69**:403, 1926.

5. Sherman, H. C., and Axtmayer, J. H.: A Quantitative Study of the Problem of the Multiple Nature of Vitamin B, J. Biol. Chem. **75**:207, 1927.

6. Hunt, C. H., and Krauss, W. E.: The Relative Antineuritic and Antipellagric Potency of Cow's Milk, J. Biol. Chem. **79**:733, 1928.

7. Aykroyd, W. R., and Roscoe, M. H.: The Distribution of Vitamin B_2 in Certain Foods, Biochem. J. **23**:483, 1929.

cereals, eggs and milk, Eddy [8] on spinach and bananas and Goldberger and co-workers [9] on the pellagra-preventing action of a variety of foods. Unpublished observations made in this laboratory have likewise indicated the poverty of certain fruits in the antineuritic substance but the presence therein of the antipellagric vitamin.

The increasing use of highly milled products, particularly of white flour, at the expense of preparations of the whole grain cereals contributes another avenue of escape of vitamin B in the present day diet. This change accentuates the loss produced by the substitution of sugar for part of the cereal of the diet. Thus, all present-day tendencies arising both from economic causes and from recent but probably mistaken nutritional teaching, promote the exclusion of the antineuritic vitamin B from the diet of the better informed and supposedly better fed portion of the population.

The effects of this decreasing intake of vitamin B are evidently not of the severe type observed on the limited diets which allow beri-beri to develop, but they are vague and scattered, as might be expected of a slowly accumulating and relatively slight deficiency. The widespread prevalence of constipation and other digestive disorders according to Cramer [10] and McCarrison [11] may be ascribed, in part at least, to such a deficiency. The modern complaint of lack of appetite in children, particularly in those fed most carefully, has been attributed by Hoobler [12] and Dennett [13] (in infants) and by Bartlett [14] largely to a lack of vitamin B. Karr [15] and Cowgill [16] have produced evidence in

8. Eddy, W. H.: Vitamin B Testing Revised, Proc. Soc. Exper. Biol. & Med. **25**:125, 1927; Hunting the Vitamin, Am. J. Pub. Health **18**:313, 1928

9. Goldberger, J., and Tanner, W. F.: A Study of the Pellagra-Preventive Action of Various Foods, U. S. Pub. Health Rep. **40**:54, 1925. Goldberger, J., and others: Ibid. **41**:297, 1926. Goldberger, J., and Wheeler, G. A.: Ibid. **42**:1299 and 2383, 1927.

10. Cramer, W.: Lancet **1**:1046, 1923; **1**:633, 1924; Brit. J. Exper. Path. **3**: 298, 1922.

11. McCarrison, R.: Studies in Deficiency Diseases, London, Oxford University Press, 1921.

12. Hoobler, B. R.: Symptomatology of Vitamin B Deficiency in Infants, J. A. M. A. **91**:307 (Aug. 4) 1928.

13. Dennett, R. H.: Routine Use of the Vitamin B Factor in Infant Feeding, J. A. M. A. **92**:769 (March 9) 1929.

14. Bartlett, W. M.: An Analysis of Anorexia, Am. J. Dis. Child. **25**:26 (Jan.) 1928.

15. Karr, W. G.: Some Effects of Water-Soluble Vitamin Upon Nutrition, J. Biol. Chem. **44**:255, 1920.

16. Cowgill, G. R.: A Contribution to the Study of the Relation Between Vitamin B and the Nutrition of the Dog, Am. J. Physiol. **57**:420, 1921.

dogs to show that appetite is directly dependent on the vitamin B intake. The frequently heard complaint of nervousness in children has also been ascribed to the same vitamin deficiency.

The study here reported was undertaken in the hope of learning whether an increase in vitamin B in the diet of a group of underweight school children attending the Garfield Junior High School in Berkeley would measurably affect their growth, as the possible result of stimulating their appetite as well as supplementing their diet in regard to this food accessory. The means chosen was the substitution of rolls containing wheat germ for white flour rolls at the noon meal.

VITAMIN B IN WHEAT GERM

It has long been known that wheat germ is rich in vitamin B. According to Voegtlin and Myers,[17] it contains the entire antineuritic substance present in the wheat berry. Osborne and Mendel[18] and Bell and Mendel[19] using the technic that measured both vitamins B and G together, stated that "water-soluble B" was distributed throughout the wheat kernel, but more richly in the germ than in other parts. They thought that one sixth of the vitamin B was present in the germ, which is approximately one fifth of the wheat kernel. Plimmer, Rosedale, Raymond and Lowndes[20] after tests on pigeons, expressed the vitamin B content of whole wheat as 8-10, wheat germ 66, bran 12-13 and middlings 12-13. The proportion of the various milling products obtained from the wheat kernel may be expressed as follows: patent flour 70, germ 1.5-2, bran 12-15 and middlings 12-15. Thus it is evident that the mixed vitamin B and G content of the wheat germ is from eight to ten times greater than that of an equal weight of whole wheat. The distribution of the vitamin B proper between the germ and the rest of the wheat kernel is undoubtedly even more unequal. According to Voegtlin and Myers,[17] all of the antineuritic property is found in the germ, and none in the endosperm and bran. If the object is to increase the antineuritic value of the diet and particularly that of bread, then it would seem that even small additions of wheat germ to bakery products will produce this result more effectively than will the

17. Voegtlin, C., and Myers, C. N.: Distribution of the Antineuritic Vitamine in the Wheat and Corn Kernel, J. Biol. Chem. **41**:10, 1920.

18. Osborne, T. B., and Mendel, L. B.: The Nutritive Value of the Wheat Kernel and Its Milling Products, J. Biol. Chem. **37**:557, 1919.

19. Bell, M., and Mendel, L. B.: The Distribution of Vitamin B in the Wheat Kernel, Am. J. Physiol. **62**:145, 1922.

20. Plimmer, R. H. A.; Rosedale, J. L.; Raymond, W. H., and Lowndes, J.: Experiments on Nutrition: VIII. Comparative Vitamin B Value of Foodstuffs: Cereals, Biochem. J. **21**:1141, 1927.

use of whole wheat flour. Thus one-half wheat germ and one-half white flour should produce a bread at least four times as rich in vitamin B as whole wheat bread, one-fourth wheat germ twice as rich and one-eighth wheat germ at least as rich as the whole wheat. As the wheat germ is free from bran and of quite acceptable flavor, changing the texture and color of the loaf less than does the whole wheat, its use appears acceptable on other grounds as well as that of its vitamin B value. Moreover, such a bread, containing 24 per cent germ, has been manufactured and successfully sold for years in England. The vitamin B content of such bread was determined by Cramer and Mottram,[21] who used rats only in their tests, but who nevertheless probably measured chiefly the antineuritic factor. Approximately 2 Gm. of this 24 per cent germ furnished as much vitamin B as from 3.5 to 4 Gm. of whole wheat bread, thus fulfilling the expectation based on the distribution of B in the wheat kernel. An even more favorable ratio might be expected from a strict comparison of antineuritic property alone.

There are excellent reasons for the overwhelming preference shown by modern industry for patent floor production as compared with whole wheat flour milling. Flour containing any part of the germ cannot be kept or shipped without spoilage. Such flour is therefore not adapted to use in large urban centers. On the other hand the wheat germ separated from the patent flour in milling may be suitably sterilized and marketed separately. Taylor[3] stated in the article previously mentioned: "If it were desirable, on economic or other grounds, to have the vitamin of the germ, specifically vitamin B, retained in the bread, it would be far better to have the baker add it artificially than to have the miller keep it in naturally." It is obvious, from the considerations brought forward, that such an addition by the baker would be far more effective than any natural retention of the germ in the relatively small proportion found in the whole wheat.

PREPARATION OF THE WHEAT GERM PRODUCTS

Preliminary tests were made on various recipes using equal parts of wheat germ and strong baker's flour to discover what the culinary possibilities might be. Palatable muffins, biscuits, yeast bread and yeast rolls were made with this mixture. An appeal was then made to the Remar Baking Company, Oakland, for regular production of the wheat germ rolls to be used in the experiment. This company was able to make excellent rolls containing 50 per cent wheat germ, which were similar in size and ingredients to the white rolls regularly used in the school

21. Cramer, W., and Mottram, J. C.: On the Nutritive Value of Bread with Special Reference to Its Content of Vitamin B., Lancet **1**:1090, 1927.

cafeteria. The rolls weighed one and one-half ounces (42.5 Gm.) each, as did the white rolls. Each child observed included two of these rolls, either wheat germ or white, in the noon meal eaten at the school. The cost of the wheat germ rolls was practically the same as that of the white rolls. Very light-colored, nut-flavored and fine-textured bread or rolls may be made with from 20 to 30 per cent wheat germ. The products containing 50 per cent are yellowish and somewhat coarser in texture.

THE RAT FEEDING DEMONSTRATION

The interest of the children was aroused through the formation of a "Health Club" which met regularly once a week and which was made up of two teams, Alpha and Beta, one taking the wheat germ rolls regularly and the other the white rolls. Simple instruction in hygiene and nutrition was given these groups, but no particular effort was made to influence the diet except as to the rolls. A feeding experiment using white rats was included in the activity of the club, and definite differences between the growth of the animals fed the wheat germ and those not fed the wheat germ were observed with great interest by the children. Wheat germ rolls or white rolls with one teaspoonful of milk daily made up the diet of these rats. The difference in appearance and size of the rats was obvious almost at once. A second generation was obtained from the wheat germ group, and again the growth experiment was repeated, this time with reversal of diets after a few weeks, and satisfactory increase in the rate of growth of the previously stunted animals. The relation of food to health was thus shown in a dramatic and understandable way. The difficulty followed that none of the children wished to remain in the white rolls group, so that the groups had to be reversed at the end of the second period of observations on the children.

The children were chosen from among those whose physical measurements indicated striking undernutrition. Practically all were from 11 to 13 years of age. Careful measurements of about 100 children were made late in October; the wheat germ feeding was begun and the measurements were repeated late in December. Similar measurements were made early in January; wheat germ feeding was instituted and measurements were repeated after seven weeks. The groups were then reversed as to wheat germ feeding, and the feeding was continued for twelve weeks. Then the measurements were made for the last time: weight, without shoes, coats or sweaters; standing height; length of trunk; circumference of chest; expansion of chest; vital capacity; sternum diameter, hand-grip by dynamometer, and alvoelar carbon dioxide by the method of Marriott.[22] The directions of Dreyer and

22. Marriott, W. M.: The Determination of Alveolar Carbon Dioxide Tension by a Simple Method, J. A. M. A. **66**:1594 (May 20) 1916.

TABLE 1.—*Changes in Weight of Underweight Children With and Without Wheat Germ*

Group	Number of Children	Period	Dates	Duration, Weeks	Average Age, Years	Diet	Average Amount Underweight*				Decrease in per Cent Underweight	Mean Gains, Lbs.	Per Cent of Expected Gain †	Difference Between Mean Gains, Lbs.	Difference Greater Than Probable Error
							At Beginning of Test		At End of Test						
							Lbs.	%	Lbs.	%					
A	36	1	Oct. 22–Dec. 14	8	11.8	With wheat germ	83.1	11.2	86.3	8.4	2.8	3.17 ± 0.26	150	A-B, 2.01 ± 0.35	5.7, significant
	42	2	Jan. 7–Feb. 21	7	12.0	With wheat germ	87.0	7.9	89.2	5.7	2.2	2.26 ± 0.22	170	A-B, 1.54 ± 0.36	4.2, significant
	44	3	Feb. 25–May 17	12	12.1	Without wheat germ	89.0	5.7	90.7	4.4	1.3	1.67 ± 0.26	50		
B	31	1	Oct. 22–Dec. 14	8	12.0	Without wheat germ	81.2	10.7	82.3	9.0	1.7	1.16 ± 0.23	71		
	47	2	Jan. 7–Feb. 21	7	12.2	Without wheat germ	86.9	8.4	87.6	7.6	0.8	0.72 ± 0.26	65		
	47	3	Feb. 25–May 17	12	12.3	With wheat germ	88.4	7.6	92.5	3.5	4.1	4.10 ± 0.22	162	B-A, 2.43 ± 0.33	7.3, significant

* Baldwin-Wood standards.
† Baldwin standards.

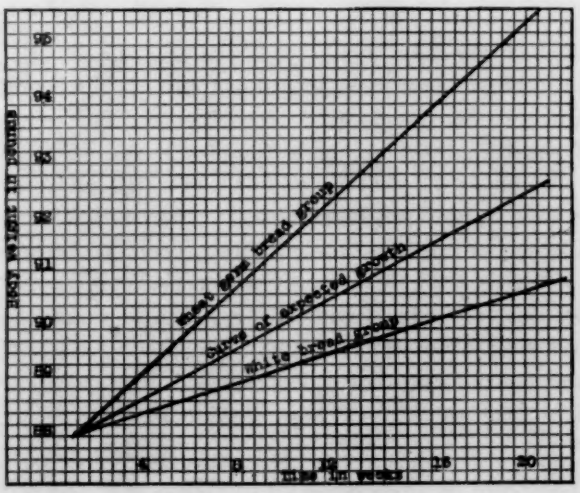

Chart 1.—Weight-growth curve for children aged 12 years as affected by wheat germ feeding.

Hanson [23] were followed in most of these physical measurements. The school records as to medical opinion on the condition of the children were consulted before the groups were finally chosen, and the two groups were made as nearly alike as possible in condition and in degree of underweight.

The plan of the experiment involved no supplementary feeding, a device that in previous studies [24] had been found effective in promoting the growth of such underweight children. Instead, supervision of the noon meal eaten in the school cafeteria five days a week was undertaken, the sole change being the substitution of wheat germ rolls in the lunches of one group for the customary white rolls in the other. The

TABLE 2.—*Increase in Height of Underweight Children With and Without Wheat Germ*

Group	Number of Children	Period	Duration, Weeks	Diet	Average Standing Height in Inches: At Beginning of Test	Average Standing Height in Inches: At End of Test	Mean gains, Inches	Difference of Gains	Difference Greater Than Probable Error
A	34	1	8	With wheat germ	59.23	59.91	0.68 ± 0.07	A-B, 0.08 ± 0.10	0.8, not significant
	42	2	7	With wheat germ	60.19	60.75	0.56 ± 0.04	A-B, 0.26 ± 0.02	13, significant
	42	3	12	Without wheat germ	60.70	61.17	0.47 ± 0.04		
B	31	1	8	Without wheat germ	58.56	59.16	0.60 ± 0.08		
	49	2	7	Without wheat germ	60.06	60.36	0.30 ± 0.04		
	46	3	12	With wheat germ	60.58	61.21	0.63 ± 0.05	B-A, 0.16 ± 0.02	8, significant

caloric value of the two kinds of rolls was supposedly the same, although the wheat germ type may have had a slightly higher value because of the higher fat content of the germ. The percentage composition of the germ used was close to: protein 30, fat 9, carbohydrate 45, ash 4 and water 12. This yields a calculated physiologic heat of combustion of 3.8 calories per gram, as compared with 3.5 calories per gram for the baker's flour. The children liked the wheat germ rolls, and many others bought them besides those in that group.

As may be seen in table 1 and chart 1, the rate of increase in weight of the wheat germ group was definitely greater than that of the control group, being approximately three times as great in each period. When the groups were reversed in period 3, again the superiority in growth

23. Dreyer, G., and Hanson, G. F.: The Assessment of Physical Fitness, New York, Paul B. Hoeber, Inc., 1927, p. 127.

24. Morgan, A. F., and Warren, L.: Stimulation of Growth of School Children by Small Supplementary Feedings, Am. J. Dis. Child. **36**:972 (Nov.) 1928.

was found in the wheat germ group. Statistical treatment of these figures indicated that the differences in gain in weight were significant in all three periods, as these differences were in all cases five times or more the size of the probable errors. The differences in gain in height, as shown in table 2, were not so great although the advantage of the wheat germ groups in periods 2 and 3 appears to be significant.

TABLE 3.—*Changes in Alveolar Carbon Dioxide Tension in Underweight Children with and without Wheat Germ*

Group	Number of Children	Period	Diet	Alveolar Carbon Dioxide Tension		
				Per Cent Showing Increase	Per Cent Showing Decrease	Per Cent Showing No Change
A	35	1	With wheat germ	51	14	35
	35	2	With wheat germ	23	31	46
	25	3	Without wheat germ	11	61	28
B	32	1	Without wheat germ	31	15	54
	33	2	Without wheat germ	15	30	55
	30	3	With wheat germ	38	36	26

TABLE 4.—*Changes in Weight and Height, Periods 1 and 2 Considered Together*

Group	Diet	Period	Dates, 1928-1929	Duration, Weeks	Average Gain in Weight, Pounds	Difference in Weight Gains, Pounds	Average Gain in Height, Inches	Difference in Height Gains, Inches
A	With wheat germ	1 and 2	Oct. 22–Feb. 21	15 (of feeding) 18 (total)	6.3 ± 0.4	A-B, 3.0 ± 0.6	1.4 ± 0.10	A-B, 0.4 ± 0.1
	Without wheat germ	3	Feb. 25–May 25	12	1.7 ± 0.2	.....	0.47 ± 0.04	
B	Without wheat germ	1 and 2	Oct. 22–Feb. 21	15 (of feeding) 18 (total)	3.3 ± 0.4	.....	1.0 ± 0.07	
	With wheat germ	3	Feb. 25–May 25	12	4.1 ± 0.2	B-A, 2.4 ± 0.3	0.63 ± 0.05	B-A, 0.16 ± 0.02

THE CHANGES IN PLASMA CARBON DIOXIDE CAPACITY

None of the other measurements, aside from weight and standing height, presented differences that were large or consistent enough to be regarded as valid, with the possible exception of alveolar carbon dioxide tension. This figure represents the alkali reserve of the blood in much the same fashion as, but probably less accurately than, the gasometric method of van Slyke and Cullen. As shown in table 3, a much larger proportion of the children fed wheat germ than of the control group made increases in alveolar carbon dioxide tension. The average of all determinations was close to 35 mm. of mercury, a figure which is slightly lower than that quoted by Marriott as normal even for infants.

A possible relationship between lowered alkali reserve of the blood and prolonged undernutrition was suggested a few years ago by work[25] done in this laboratory on children who were being given supplementary lunches. In that series, a definite rise in plasma bicarbonate, as determined by the gasometric method, was found in those children who

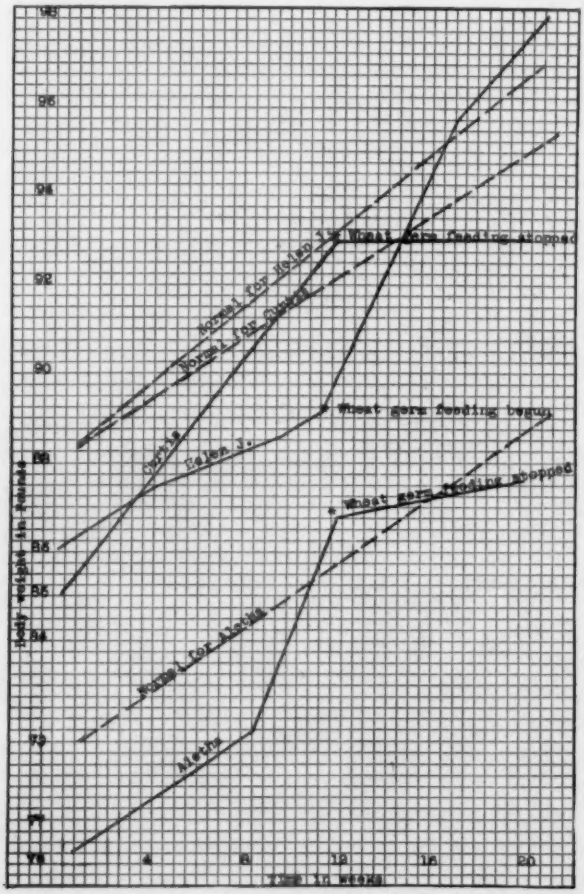

Chart 2.—Representative weight curves for children, showing effect of wheat germ feeding.

increased their body weights markedly, and little or no change occurred in those who did not improve. If undernutrition is accompanied by chronic partial starvation the existence of a relative acidosis in these

25. Morgan, A. F., and Hatfield, G. D.: The Effect of Various Supplementary Lunches on the Plasma Carbon Dioxide Capacity of Children, Am. J. Dis. Child. **32**:655 (Nov.) 1926.

children is not surprising, and any agency which tends to increase food intake might be expected to decrease that acidosis.

If periods 1 and 2 are considered together and compared with period 3, as shown in table 4, an even more striking advantage in weight increase was observed in the wheat germ fed groups, as well as a definite advantage in height increase in both periods. The gain in weight for the wheat germ fed groups is apparently fairly constant, averaging 0.35 pounds (158.7 Gm.) per week in both fall and spring periods. The groups not fed wheat germ, however, showed more variability, gaining 0.14 pounds (63.5 Gm.) per week in the spring and 0.18 pound (81.6 Gm.) in the fall. There seems to be little evidence of seasonal effect. In chart 2 the weight curves of three of the children are compared with the expected normal curves, and the striking effect of adding or dropping the wheat germ feeding is indicated.

If these gains in both weight and height be compared with those made by other groups, it will be found that the wheat germ groups showed considerably better growth than did any other comparable groups similarly observed. In a study made at the Claremont school [26] the greatest rate of gain seen was that for a group of ten children who were fed oranges, 0.38 pounds (172.3 Gm.) per week for eight weeks. In a study at the California State School for the Blind [27] the best rate was 0.24 pounds (108.8 Gm.) per week for fourteen weeks (in thirteen children who were given extra milk), in the Prescott School study [21] 0.15 pound (68 Gm.) per week for ten weeks (fifty children given extra milk). The recent British studies [28] showed a maximum increase for seven months of 0.21 pound (95.2 Gm.) per week in a milk-fed group of 137 children 13 years of age. Weight increases in the younger milk-fed groups were 0.12 pound (54.4 Gm.) for children aged 9 and 0.09 pound (40.8 Gm.) for children aged 6. In the Malden studies,[29] the best increase was 0.18 pound per week for twenty months gained by 141 girls about 11 years of age. The wheat germ groups in the study here reported gained 0.35 pound (158.7 Gm.) a week for eighteen and twelve weeks, respectively, with an average of thirty-nine and forty-

26. Chaney, M. S.: A Comparison of the Value of Milk and Oranges as Supplementary Lunch for Underweight Children, Am. J. Dis. Child. **26**:337 (Oct.) 1923.

27. Morgan, A. F.; Hatfield, G. D., and Tanner, M. A.: A Comparison of the Effects of Supplementary Feeding of Fruits and Milk on the Growth of Children, Am. J. Dis. Child. **32**:839 (Dec.) 1926.

28. Leighton, G., and Clark, M. L.: Milk Consumption and the Growth of School-Children, Lancet **1**, no. 5497, 1929.

29. Turner, C. E.: Malden Studies on Health Education and Growth, Am. J. Pub. Health **18**:1217, 1928.

seven children in the groups. The number of subjects, the length of periods and the statistical analysis of the latter observations indicate a true acceleration of growth in these moderately underweight children when given about three-fourths of an ounce of wheat germ daily in the form of rolls.

The best increase in height shown in the Prescott study [24] was 0.055 inches (0.139 cm.) per week in an orange-fed group of forty; in the British studies,[28] 0.05 inches (0.127 cm.) per week in 242 milk-fed children aged 6 years, and in the Malden studies,[29] 0.044 inches (0.111 cm.) per week in 141 girls 11 years of age. In the study here reported, the groups fed wheat germ gained 0.077 and 0.046 inches (0.195 and 0.117 cm.) per week. The latter gain is not significantly better than that shown in the same period by the group not fed wheat germ.

It should be noted finally that the increase in vitamin B (antineuritic, B 1, or F) obtained by including wheat germ bread in the diet is not to be ascribed merely to the change in character of vitamin B intake in the bread fraction of the diet, such as has been advocated for instance by whole wheat enthusiasts, but to an absolute increase in total vitamin B eaten which probably cannot be secured in such degree by any other change in food habits. Similar inclusion of a notable amount of rice polishings or of dried yeast would undoubtedly produce a similar result, but so far as our present knowledge of the antineuritic property of foods indicates, in no other way can the diet be perceptibly improved in this regard.

The complacent recognition that fruits, vegetables, meat and milk supplement the cereals by their greater content of vitamin G (anti-pellagric or B 2) misplaces the emphasis, since a relative deficit is now far more likely to occur in vitamin B than in vitamin G.

The practical question of the supplying of wheat germ by millers for human use is complicated somewhat amusingly by the legal requirement which exists in many states that middlings sold for stock feed must not be robbed of their wheat germ. Many cereal breakfast foods now on the market claim wheat germ content, but none are actually richer in this part of the kernel than is whole wheat.

The inclusion of a considerable proportion of clean, bran-free sterilized wheat germ in bread, rolls, muffins, crackers, waffles, doughnuts, fruit cakes, and indeed all bakery and flour products is much to be desired, particularly in the diets in institutions, hospitals, schools and homes with children. Similar use of rice polishings may prove desirable. An increase in the proportion of baker's yeast used in bread can hardly be expected to function as well, however, since the amount necessary would give the bread an undesirable flavor, and since the availability of the proteins, calcium and phosphorus thus introduced, as shown by

Still and Koch,[30] would be low. Moreover the danger of intestinal disturbance from large intakes of yeast must be taken into account.

SUMMARY

1. Two groups including from thirty-one to forty-seven underweight children from 11 to 13 years of age were compared as to growth in weight, height and certain other physical measurements over three periods totaling thirty weeks.

2. Each child in one of these groups in each period was required to include in the noon meal 3 ounces (85 Gm.) of rolls made with 50 per cent wheat germ and 50 per cent white flour. The control group took the usual white flour rolls; thus the former group ingested a total of 5 ounces of wheat germ per week.

3. The weight increases in each of the wheat germs periods were about three times as great as in the control periods. The difference in all cases was five or more times greater than the probable error of the difference.

4. The height increases were significantly greater in two of the wheat germ periods than in the corresponding control groups.

5. Alveolar carbon dioxide tension was increased in a larger percentage of the wheat germ-fed children than in the controls, a change possibly due to the diminished acidosis following increased food intake.

6. The significance of these observations is discussed in relation to the recent discovery of the multiple nature of vitamin B and of the poverty of the major foods—fruits, vegetables, milk and meat—in the antineuritic substance (vitamin B, Bl, F). The importance of whole cereals, but more particularly of grain embryos, such as those of wheat and of rice, as a possible source of this vitamin is pointed out. The probable relation of the decreasing vitamin B content of the modern diet to decreased appetite in children, nervousness, constipation and possibly other gastro-intestinal disturbances is also discussed.

30. Still, E. U., and Koch, F. C.: The Biological Value of Yeast Proteins for the Rat, Am. J. Physiol. **87**:225, 1928.

FIVE YEARS' CLINICAL EXPERIENCE WITH LEMON JUICE-MILK *

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In 1924, Hess and Matzner [1] introduced the modification of cow's milk by means of fruit juices. These investigators added various juices containing natural organic acids in order to render the milk sufficiently acid to counteract its buffer constituents and at the same time to provide a sufficient quantity of antiscorbutic vitamin. The first attempt was made with canned tomato juice, the p_H of which is about 4.2. This addition, according to Hess, "although fulfilling its object in regard to providing adequate antiscorbutic vitamin, was found to be insufficient in regard to its acidity; except when used in very large amounts, it cannot adequately increase the hydrogen ion concentration of milk." Attention was next directed to the use of orange juice, the acidity of which ranges from a p_H of about 3.54 to 3.71. It was soon learned, however, that as much as 200 cc. of orange juice would be required to bring a liter of cow's milk from a p_H of 6.52 to 5.49. Lemon juice was therefore resorted to; this has a p_H of about 2.12 and a citric acid content of from 6 to 7 per cent. One cubic centimeter of lemon juice is about equivalent to 1.25 cc. of a normal hydrochloric acid solution; the addition of 21 cc. to a liter of whole cow's milk changes its p_H from 6.64 to 5.54, and 28 cc. lowers it to 5.35. Similar values were obtained with raw, heated or pasteurized milk. It should be added that the lemon juice aids digestion, not merely in view of its buffer action, but also as the result of the change in physical constitution which it brings about in the milk. As is well known, the addition of citric acid effects a curd in cow's milk which is comparable to the fine curd of woman's milk. Brenneman [2] emphasized the importance of this factor in the digestion of milk.

* Submitted for publication, Dec. 26, 1929.

* From the Home for Hebrew Infants, service of Dr. Alfred F. Hess.

1. Hess, A. F., and Matzner, M. J.: The Value of Milk Acidified with Lemon Juice: Its Combination with Egg Yolk to Add the Antirachitic Factor, J. A. M. A. **82**:1604 (May 17) 1924.

2. Brenneman, J.: The Curd and the Buffer in Infant Feeding, J. A. M. A. **92**:364 (Feb. 2) 1929.

The preparation of lemon juice-milk is simple. When diluted milk is used, the lemon juice is added to the water or other diluent, which is added slowly to the requisite amount of milk. If whole milk is employed, however, the fruit juice is added drop by drop, the solution being stirred after each drop in order to avoid curdling. The standard formula as recommended by Hess is as follows: milk, 24 ounces (710 cc.); water, 12 ounces (355 cc.); sucrose, ½ ounce (15 Gm.); lemon juice, 21 cc. The p_H of this mixture is about 5.30. In the routine use of this preparation for 145 infants, we have used, during the past few years, a somewhat larger amount of lemon juice, namely, 3 per cent, or 28 cc. per liter of dilute or whole milk, thus obtaining a still lower hydrogen ion concentration.

Even greater amounts of lemon juice may be used in order to bring the p_H down to the level of that of butter milk or of lactic acid milk. It may be stated that we have successfully added lemon juice to protein milk in the feeding of thirty-five infants. Lemon juice-milk cannot be distinguished grossly from ordinary milk mixtures, except for the presence of minute flocculi. The lemon imparts to the milk a delicate, pleasant flavor; its acidity is barely detectable.

Since 1924 there have been numerous reports regarding the value of milk to which orange juice or lemon juice has been added. Some have introduced this preparation in dispensary practices. A particularly favorable opinion was given in 1926 by Hess,[3] who expressed a preference for the addition of orange rather than lemon juice. In Germany, this form of milk mixture has been used with evident success, although by some citric acid has been considered as the counterpart and equivalent of lemon juice, the factor of antiscorbutic content having been lost sight of. Egg yolk may be combined with lemon juice-milk, in this way making it possible to prepare a complete food, one which is adequate not only in the antiscorbutic vitamin, but in the antirachitic factor, and which contains, as well, an additional amount of vitamin A and iron. It might be added that Stoeltzner [4] has just sponsored the use of egg yolk in infant feeding.

Citric acid is one of the normal constituents of cow's milk, the quantity of this organic acid increasing in percentage when the fodder of the cows is changed from that of stall feeding to that of grazing. Attention may be called to the work of Blatherwick and Long,[5] and of

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3. Hess, J. H.; Koch, E. M., and Sennewald, Z. C.: Peptic Digestion of Cow's Milk: The Effect of Various Modifications Used in Infant Feeding, J. A. M. A. **87**:1360 (Oct. 23) 1926.

4. Stoeltzner, W.: Eisuppe als Säuglingsnahrung, Deutsche med. Wchnschr. **56**:4 (Jan.) 1930.

5. Blatherwick, N. R., and Long, M. L.: Studies of Urinary Acidity: Some Effects of Drinking Large Amounts of Orange Juice and Sour Milk, J. Biol. Chem. **53**:103 (July) 1922.

Chaney and Blunt,[6] who have clearly proved the ability of the body to metabolize completely large quantities of citric acid into carbon dioxide and water without demonstrable changes in urinary acidity, an action which is unlike that following the ingestion of lactic or of hydrochloric acid, which induce a marked increase in the excretion of acid. Naturally, with the addition of an acid to the diet, the question arises as to the possibility of damage to the kidneys. Greene[7] found that infants who received 45 cc. or more of a tenth-normal solution of hydrochloric acid in the milk showed distinct evidence of renal irritation, such as the presence of albumin, casts and red blood cells in the urine. Casts were demonstrable occasionally in the urine of a few infants who received 8 cc. of lactic acid (U.S.P. 87 per cent) to a liter of milk. In a larger series of infants fed on lemon juice-milk, he was, however, unable to find any trace of renal irritation, an observation which has been borne out by our clinical experiences of the past few years.

Somewhat over five years have elapsed since the introduction of lemon juice-milk. During this period, we have employed the preparation in the routine feeding of 145 infants varying in age from 6 weeks to a year or more, so that it seemed worth while to review our experiences and to analyze and evaluate the clinical results. The advantage of a study of this kind carried out in an institution is that all conditions of surroundings and of care are uniform. Perhaps the most reliable criterion for judging the advantages or disadvantages of a food for infants is its effect on rate of growth. In addition, of course, attention must be directed to its effect on the general appearance, the musculature, the appetite and the stools, as well as its effect on the gastrointestinal tract during parenteral infection. At the onset, it may be stated that in no instance have we encountered refusal of food following the change from nonacidified milk to lemon juice-milk; there was a tendency, rather, for the appetite to be stimulated. We wish to emphasize the fact that the stools have been uniformly smooth, yellow and devoid of undigested food residue, with a tendency toward an alkaline reaction to litmus paper.

In order to ascertain the relative gain in weight of the infants who received lemon juice-milk, a table was compiled and a comparison made with the average rate of gain of other infants in the institution (table 1). The latter figures were obtained from a previous study on the relationship of nutrition to pneumonia in infancy and in childhood.[8] To

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6. Chaney, M. S., and Blunt, K.: The Effect of Orange Juice on the Calcium, Phosphorus, Magnesium and Nitrogen Retention and Urinary Organic Acids of Growing Children, J. Biol. Chem. **66**:829 (Dec.) 1925.

7. Greene, D.: Effect on Urine of Addition of Acids and Alkalis to the Diet of Infants, Am. J. Dis. Child. **35**:38 (Jan.) 1928.

8. Barenberg, L. H.; Greene, D., and Abramson, H.: The Relationship of Nutrition to Pneumonia in Infancy and Childhood, J. A. M. A. **92**:440 (Feb. 9) 1929.

facilitate comparison, we divided the total number of infants represented in table 1 into three age groups: those under 3 months, those from 3 to 6 months, and those from 6 months to 1 year old. As indicated, twenty infants with an average age of 2¼ months and an average weight of 10 pounds (4.54 Kg.) received lemon juice-milk for almost five months. At the end of this period of observation, their average weight was 16½ pounds (7.5 Kg.) as compared with the institutional standard of 15 pounds (6.8 Kg.) for this age. Thus they showed a gain of about 22 ounces (574 Gm.) per month, in comparison with the standard gain of 16.8 ounces (476 Gm.) per month. The second groups consisted of seventy-five infants who were given lemon juice-milk for about six months. Their gain averaged 17.3 ounces (490 Gm.) per month, equaling that of the institutional standard for the corresponding age. A third group of forty-five infants showed an aver-

TABLE 1.—*Gain in Weight of Infants Receiving Lemon Juice-Milk Compared with the Average Gain of Other Infants in Institution*

		At Beginning of Study		Other Infants'	At End of Study		Other Infants'		Average Monthly Gain	
Age, Mo.	Infants Fed Lemon Juice-Milk	Average Age, Mo.	Average Weight, Lb.	Average Weight, Lb.	Average Age, Mo.	Average Weight, Lb.	Average Weight, Lb.	Average Duration, Mo.	Infants on Lemon Juice-Milk, Oz.	Other Infants, Oz.
0-3	20	2¼	10 (4.5 Kg.)	10 (4.5 Kg.)	7	16½ (7.5 Kg.)	15 (6.8 Kg.)	4¾	22 (574 Gm.)	16.8 (476 Gm.)
3-6	75	4¼	12¼ (5.5 Kg.)	11¾ (5.3 Kg.)	10¼	18¾ (8.5 Kg.)	18½ (8.3 Kg.)	6	17.3 (490 Gm.)	17.3 (490 Gm.)
6-12	45	8	16½ (7.5 Kg.)	16 (7.3 Kg.)	13	21 (9.5 Kg.)	20 (9 Kg.)	5	14.4 (405 Gm.)	12.8 (362 Gm.)

age gain of 14.4 ounces (405 Gm.) per month over a period of five months, as compared with the standard gain of 12.8 ounces (362 Gm.). It is evident that, in general, the infants who received lemon juice-milk manifested a better rate of growth than those who received other forms of milk. This was evident more particularly in the group under 3 months of age.

There are other important aspects which merit consideration. The well known prevalence of respiratory infections during the winter months, with their associated intestinal disorders, prompted us to investigate the effect of lemon juice-milk on the stools of infants during infections. We selected a four month period from January to May, the time when respiratory disorders are most prevalent. A glance at table 2 shows that the twenty-five infants under 12 months of age, who received lemon juice-milk for a considerable period prior to the onset of infection, developed diarrhea less often (18 per cent) than a corresponding group of infants who did not receive lemon juice-milk (50 per cent). The duration of diarrhea in each group was practically the

same, from five to six days. Lemon juice-milk would seem to exercise a protective influence against intestinal disturbance in children under 1 year of age. It seemed that a similar study of an older group of children might lead to interesting results. Accordingly, twenty-five infants varying in age from 1 to 2 years and cared for in the same ward were given 3 per cent of lemon juice in their milk in addition to their regular dietary. The same four month period, January to May, was selected for study, in order that we might be assured that we were dealing with the same type of infection that prevailed among the infants of the other group. At the same time, fifty children of corresponding age who did not receive lemon juice-milk were observed in two other wards. As shown in table 2, the lemon juice-milk was not able to protect the children from infection. In fact, it so happened that this group had the greater number of infections. However, the intestinal disturbance was of much shorter duration among those receiving lemon juice, lasting on

TABLE 2.—*The Effect of Lemon Juice-Milk on the Stools of Infants in the Course of Infection*

Groups Compared	Age, Mo.	Number of Infants	Number of Infections	Number Developing Diarrhea	Percent of Infants Having Diarrhea	Average Duration of Diarrhea, Days
50 infants receiving lemon juice-milk.....	0-12	25	64	12	18	5
	12-24	25	83	7	8	1
75 infants not receiving lemon juice-milk	0-12	25	75	38	50	5-6
	12-24	50	114	39	34	4

the average for but one day as compared with four days among the children in the wards in which lemon juice was not given. Here we note again the beneficial effect of this preparation as a prophylactic against the diarrhea resulting from parenteral infection. The diarrhea which occurred among the infants who received lemon juice-milk was decidedly milder, requiring no further treatment, whereas the diarrhea in the control group necessitated the use of other therapeutic measures. We believe that the better rate of growth of the infants who received lemon juice-milk was due, in part, to the fact that they were less subject to diarrhea and that the latter was less prolonged and less severe.

We wish to call attention to the use of lemon juice-milk as a food for children 3 years of age or over, suffering from pneumonia and other respiratory disorders. It was found that such children did not suffer from flatulence or abdominal distention and relished this slightly flavored milk better than the ordinary sweet milk. We have made use of lemon-juice milk for a few children suffering from diarrhea due to causes other than infection, and, with the same degree of success, for spastic infants suffering from abdominal colic.

SUMMARY

An analysis has been made of the records of 145 infants who received lemon juice-milk for periods of from six to twelve months. This study embraced a five years' clinical experience with infants less than 3 months, from 3 to 6 months, and from 6 to 12 months old. In general, the infants who received lemon juice-milk manifested a better rate of growth than those who received other milk preparations.

A study was also made of the effect of lemon juice-milk on the stools of infants during the course of parenteral infection. The period from January to May was selected for analysis, a time when respiratory infections are most prevalent and are usually associated with intestinal disturbances. Comparison made with a control group of children showed that among those who received lemon juice-milk fewer cases of diarrhea developed and that these cases were milder.

A more striking result was obtained when lemon juice-milk was given prophylactically to a group of twenty-five older children and a comparison made with a control group of fifty children of similar age. Although the number of infections during the four months was proportionately greater among those who received lemon juice-milk, the number of instances of diarrhea was much less for this group.

Lemon juice-milk was found of value as a food for children suffering from pneumonia and other respiratory ailments.

CROUP

AN ANALYSIS OF THREE HUNDRED AND FORTY-FOUR CASES *

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The series of cases considered in this analysis includes 344 patients suffering from croup who were admitted to the Willard Parker Hospital. All these patients were treated in the course of one year, although they do not include all of the cases of croup of that particular year. In the cases omitted, either laryngoscopy was not performed or cultures were not made when the patients were admitted.

The routine procedure in each case consisted of a direct laryngoscopic examination, examination of cultures [1] taken from the larynx, the nose and the throat and, in addition, the usual physical examination. Results showed the interesting fact that a large percentage of cases of croup diagnosed outside the hospital as laryngeal diphtheria were not diphtheria.

TABLE 1.—*Observed Percentages of the Chief Causes of Croup*

Diphtheritic Laryngitis (Either Primary in Larynx or Secondary to Diphtheria Elsewhere)	Catarrhal Laryngitis	Other Conditions	Total
212	126	6	344
61.6%	36.6%	1.7%	

In the first part of the article I propose to show the general conditions accompanying laryngeal diphtheria, the treatment accorded the patients and the effects noted as a result of the various types of treatment. The second part will deal with catarrhal laryngitis, the treatments given and their results. The final part of the discussion will be devoted to the other observed causes of croup.

LARYNGEAL DIPHTHERIA

Of the 344 cases of croup observed, 212, or 61.6 per cent, were found to be due to diphtheria. Laryngeal diphtheria may be secondary to diphtheria of the nose and the throat, or it may occur primarily and only in the larynx. Table 2 shows the distribution according to sex, seasons of the year and age.

* Submitted for publication, Dec. 24, 1929.

1. The routine nasal, pharyngeal and laryngeal cultures were examined in the Health Department Laboratory at 505 Pearl Street, New York City. The special laryngeal cultures were examined by Miss A. Lamont, in the Willard Parker Hospital Laboratory.

The youngest patient in the series was a girl, aged 5 months. She was ill with symptoms of a cold thirteen days before admission to the hospital. When admitted, membrane was found in the nasopharynx, larynx and trachea. The nose, throat and laryngeal cultures were positive for Klebs-Löffler bacilli. A postmortem examination showed the membrane extending into the bronchi and bronchioles.

The oldest patient in the series was a woman aged 21. Her tonsils were excised thirteen days before admission to the Willard Parker Hospital. Five days after the operation, she developed a huskiness of the voice which grew worse steadily until she became aphonic. The patient was admitted to the hospital seven days after the hoarseness was first noticed. She was very ill, suffering from marked dyspnea. The tonsillar fossae were filled with a thick yellowish exudate. The uvula and

TABLE 2.—*Distribution of Laryngeal Diphtheria by Sex, Season and Age*

Sex

Male	Per Cent	Female	Per Cent
119	56.1	93	43.9

Seasonal Distribution

July	7	January	23
August	4	February	31
September	7	March	22
October	15	April	35
November	23	May	19
December	19	June	7

Age

		Per Cent
1 year and under	12	5.7
13 months to 2 years	55	25.9
2 years to 3 years	60	28.3
3 years to 5 years	50	23.6
5 years to 10 years	32	15.0
10 years and over	3	1.4

the faucial pillars were markedly edematous but were not covered with membrane. The patient coughed up a complete cast of the larynx, trachea and bronchi before suction could be employed. The membrane forming the cast was tough and yellowish white. After coughing up the cast, the patient was comfortable and remained so. She was discharged from the hospital six weeks after admission. When discharged she was suffering from postdiphtheritic paralysis from which she eventually recovered completely.

Distribution and Description of Membrane in the Larynx.—The membrane seen in the larynx was white or yellowish white. Sometimes it had a patchy distribution. At other times it completely lined the larynx. At times it was limited to the epiglottis, the false cords and the arytenoids, or again it involved only the true cords and the subglottic region. Again it extended into the trachea, the bronchi and the bronchioles. It was usually thinner than membrane found on the tonsils or their contiguous tissues, and it was more easily detachable. In the

earliest stage of laryngeal involvement, the laryngeal mucosa was injected, was quite swollen and had an extremely thin and adherent membrane. After the first day the membrane was slightly thicker and somewhat easier to remove. In the later stages (about the fourth day), the membrane was still thicker and was usually partially loosened. It was easily detached and usually came off in large pieces. There was little or no swelling of the laryngeal mucosa in the later stages.

Treatment for Laryngeal Diphtheria.—The general procedure in the treatment for laryngeal diphtheria was to give diphtheria antitoxin intravenously, to remove the membrane from the larynx, trachea and bronchi by suction and to employ intubation as a final resort. Fewer

TABLE 3.—*Distribution of Membrane in Nose, Throat and Larynx*

1. Membrane in larynx only	49	23.1%
2. Membrane on tonsils or fauces (or both) with membrane in larynx	86	40.6%
3. Nasopharyngeal diphtheria with membrane in larynx	63	29.7%
4. Nasal diphtheria with diphtheritic membrane in larynx, throat clear	14	6.6%

TABLE 4.—*Location of Membrane in the Larynx*

Above the vocal cords	19	9%
On and below true cords	106	50%
Above and below true cords	73	34.4%
No membrane in larynx, larynx inflamed, culture for Klebs-Löffler bacillus positive, with tonsillar membrane, diagnosed early laryngeal with tonsillar diphtheria	10	4%
No membrane in larynx, larynx inflamed, mildly swollen, clinically croup, laryngeal culture negative, tonsillar diphtheria culture positive	3	1.4%
No membrane in larynx, larynx inflamed, culture negative, nasal discharge, nasal culture positive clinically, croup (mild)	1	0.5%

intubations were necessary because aspiration of the membrane from the larynx and trachea was an effective method of relieving the respiratory obstructive symptoms.

A sufficient dose of antitoxin should be given intravenously rather than intramuscularly because of its quicker effect. The larynx is found to become and to remain free from membrane about twenty-four hours earlier when the antitoxin is given intravenously. All of our patients with laryngeal diphtheria received antitoxin intravenously on admission, except those who had received a large dose (20,000 units or more) of antitoxin intramuscularly at least a day before admission. Observation has shown that it requires from two to two and a half days after intravenous injection of antitoxin and from three to three and a half days after intramuscular injection of antitoxin before the larynx remains free from membrane. Before that time the membrane forms again after removal. Twenty-four hours saved means fewer suctions, fewer

intubations, less danger of bronchopneumonia, more rest for the patient and consequently a lower mortality.

The suction treatment for laryngeal diphtheria described in this paper is not new. In March, 1923, Gover and Hardman,[2] then at the Willard Parker Hospital, reported a series of fifty cases. In 1916, Lynah[3] reported a mortality of 64.6 per cent in a series of patients with tracheobronchial diphtheria treated by suction through a bronchoscope.

Since Hardman suggested applying the suction method of treatment for laryngeal diphtheria, it has been used as a routine measure in the Willard Parker Hospital, the only difference being that while Hardman preferred to use silk elastic catheters, metal tubes are now employed. The method as he described it is: "direct laryngoscopy, Boyce position, using either specially made metal tubes or silk elastic catheters and a motor driven pump." The procedure ordinarily takes only a few minutes. The indications for suction are the same as those for intubation.

TABLE 5.—*Number of Times Suction was Applied*

	Number	Per Cent
Laryngoscopic examination only, no suction	53	25.0
Laryngoscopic examination, one suction	97	45.8
Laryngoscopic examination, two suctions	33	15.6
Laryngoscopic examination, three suctions	16	7.5
More frequent suction	13	6.1

The majority of our patients required only one treatment. Table 5 shows the number of times suction was required. The greatest number of times suction was resorted to in any one case was eight. Suction was repeated only when dyspnea became urgent. The average time between suctions was six hours. The longer the time between suctions, the better is the prognosis, as to both eliminating the necessity of intubation and hastening recovery from the illness.

Laryngeal Diphtheria with Tracheal or Tracheobronchial Membrane.—In this group only those cases of diphtheria are included from which partial or complete casts were obtained from the trachea or from both the trachea and the bronchi. It is granted that in some of the laryngeal cases there may have been membrane extending into the trachea. But if the membrane was thin and adherent and neither caused obstructive symptoms nor was dislodged on suction of the larynx and trachea, the case was classified as laryngeal, the tracheal involvement not being diagnosed.

2. Gover, R. W., and Hardman, R. P.: Preliminary Report on the Treatment of Laryngeal Diphtheria by Suction, Arch. Pediat. **40**:170, 1923.

3. Lynah, H. L.: Treatment of Diphtheria of the Tracheobronchial Tree, Laryngoscope **26**:158, 1916.

Three of the thirteen patients with membrane extending into the trachea had no membrane in either the nose or the throat. Suction was performed in thirteen cases, and from three a complete cast of the larynx and of the trachea was obtained. Partial casts were obtained from the other ten cases. In addition to the suction treatment, intubation was performed in five of these cases. The intubation was done because of the accompanying laryngeal stenosis. All of the patients on whom intubation was performed recovered.

Eight of the twenty-six patients with tracheobronchial involvement had no membrane in the nose or the throat. The diagnosis was made by laryngoscopic examination and suctions of the larynx and trachea. From two cases, complete tracheobronchial casts were obtained; one patient coughed up a complete laryngotracheobronchial cast before suction could be instituted, and from the other twenty-three partial casts were obtained. Omitting the patient who coughed up the tracheobronchial cast before suction could be instituted, nineteen of the remaining twenty-five patients were relieved from dyspnea after suction. The other six were not

TABLE 6.—*Number of Patients with Tracheal or Tracheobronchial Membrane*

With membrane extending into trachea, 2 died, 15.4% of the trachea cases	13 or 6.1%
With membrane extending into trachea, bronchi and sometimes into bronchioles, 15 died, 57.6/% of the tracheobronchial cases	26 or 12.3%

relieved, and intubation was performed. Four of those on whom intubation was performed died and two recovered. A complete cast of the trachea and bronchi was obtained from the latter two prior to intubation.

The average number of times suction was performed in the tracheobronchial cases was two. Four of the eleven patients who were cured developed postdiphtheritic paralysis. After the third and last suction, one of the patients with tracheobronchial diphtheria developed subcutaneous emphysema involving the face, neck and chest. The emphysema, however, was completely absorbed after eight days, and the patient was eventually discharged in perfect health.

N. Turner Welford [4] reported the cases of twenty-four patients with tracheobronchial diphtheria who were treated with large doses of antitoxin and intubation. None of his patients was treated with suction. One of the twenty-four patients coughed up a cast of the trachea and bronchi, and he recovered. The mortality in Welford's series was 95.8 per cent.

4. Welford, N. Turner: Tracheobronchial Diphtheria, Am. J. Dis. Child. **37**:944 (May) 1929.

The Willard Parker Hospital series of twenty-six cases of tracheobronchial diphtheria is comparable to that of Welford. Twenty-six cases were symptomatically of the same type as those described by Welford. The duration of illness was from four to seven days; the patients were toxic and were suffering from severe respiratory obstructive symptoms. All of the patients from the Willard Parker Hospital were treated with suction of the larynx and trachea, in addition to intravenous administration of antitoxin. The average dose of antitoxin for this type of case was 20,000 units. The lower mortality from the Willard Parker Hospital of 57.6 per cent as compared with Welford's 95.8 per cent must be ascribed to the suction treatment, and it seems to present a strong case for the efficacy of this treatment, a point I wish especially to stress.

The further fact that Welford reported that in two of his cases the intubation tube pushed the membrane toward the bifurcation, producing complete obstruction and asphyxia, indicates that if suction had been

TABLE 7.—*Comparison of Results of Suction Versus No Suction Treatment*

Nonsuction Series		
Number of Cases	Patients Intubated	Mortality in Intubated Patients
697	286 or 41%	119 or 41.6%
Suction Series		
Number of Cases	Patients Intubated	Mortality in Intubated Patients
212	42 or 19.8%	7 or 16.7%

resorted to and the membrane had been removed before intubation this complication could not have occurred. In his summary, Welford concluded that "aspiration is indicated if performed before the onset of the myocardial failure." The observations from the Willard Parker Hospital agree with the conclusion that asphyxiation can be prevented and the incidence of secondary bronchopneumonia lessened, but it has been found that death from the effect of toxemia on the heart cannot be averted.

The beneficial results of suction treatment contrasted with intubation without suction are best shown by the comparison drawn in table 7. The nonsuction series of cases was compiled in an unpublished report by A. J. Dickson at the Willard Parker Hospital in 1918 and 1919. He and his co-workers examined 697 cases and verified the diagnosis of laryngeal diphtheria.

In this connection I wish to refer to Gover's [5] series of 189 cases of croup examined with the laryngoscope. Gover did not use suction to remove the membrane, but employed forceps. Twenty-three of his

5. Gover, R. W.: Direct Laryngoscopy in One Hundred and Eighty-Nine Cases of Croup, Am. J. Obst. **77**:698, 1918.

patients were treated in this way, so it seemed better not to use his series as a comparison with the patients in the Willard Parker Hospital series treated with suction. To use his series, however, one might subtract the cases of the seventy-seven nondiphtheritic patients and of the twenty-three patients with diphtheria treated by removal of the membrane with forceps, leaving eighty-nine patients with laryngeal diphtheria, thirty-six, or 40 per cent, of whom were treated by intubation.

The types of cases in which the patients are usually not improved by suction are:

1. Early cases of laryngeal diphtheria. The membrane is thin and adherent, and the underlying tissues are quite edematous. Suction in these cases usually increases the edema; therefore, the patients are harmed rather than improved by the treatment. Often these cases require intubation.
2. Tracheobronchial cases in which the membrane extends into the smaller bronchioles.
3. Nondiphtheric laryngitis associated with much laryngeal edema.

Patients with a heavy, well formed membrane in the larynx or in the larynx and trachea accompanied by slight or moderate swelling of tissues show the most rapid improvement. Here the alarming symptoms of dyspnea abate immediately after the membrane is removed, and the child falls asleep before it is taken from the table.

The advantages of suction are:

1. Complete relief from dyspnea in the majority of cases, necessitating fewer intubations.
2. Less frequent incidence of bronchopneumonia.
3. Lessened mortality.
4. In cases that come to intubation, if suction is performed prior to intubation it practically does away with "blocked tubes," because all loose membrane and mucus have been removed.
5. Relief from alarming symptoms in many cases of tracheobronchial diphtheria. It is obvious that if the trachea or a bronchus is blocked with membrane, an intubation tube alone can offer no relief. It is too far above the seat of trouble.

   At its best the death rate is high in this type of case because the incidence of bronchopneumonia is high and because these cases usually are late cases of diphtheria with extensive membranous involvement of the nasopharynx, so that the late complications of diphtheria (paralysis, myocarditis) are prone to develop even though the symptoms of respiratory obstruction abate.

Suction, however, also has its dangers, although when used by a skilled physician who can also perform an intubation or a tracheotomy, such danger is slight. An inexperienced operator, however, might form a false passage with the metal tubes, with all its attendant dangers. Neither laryngoscopic work nor laryngeal suction should be performed

by an inexperienced person unless an experienced operator is present. Most of the patients are young children in whom the larynx is small, and even a small amount of trauma may cause alarming symptoms. To work effectively, the operator must have developed not only manual dexterity, but also judgment for the individual case as to what to do, how much to do and when to do it.

Intubation is performed in those cases in which the accompanying edema is the chief cause of the dyspnea and in those cases in which the membrane is too adherent to be removed. In the case with adherent membrane, the membrane is usually thin and of itself would not cause alarming symptoms; the underlying edema is the cause of the dyspnea. Frequent instrumentation in these cases does more harm than good, even in the hands of experienced operators; therefore as soon as intubation is required, it should be done. The child should not be allowed

TABLE 8.—*Incidence and Mortality in Series of Bronchopneumonia*

Treatment	No.	Bronchopneumonia		Deaths	
		No.	Per Cent	No.	Per Cent
Suction	170	12	7	5	41.7
Intubation (and suction)	42	11	26.7	7	63.6

TABLE 9.—*Mortality of Laryngeal Diphtheria with Suction Treatment*

	Total Number of Cases	Suction and Intubation	Suction Only
	212	42	170
Died	27	7	20
Percentage of mortality	12.7	19.8	11.7

to weaken itself to such an extent that when the operation is performed it is too late.

As shown in a previous paragraph, after suction of the larynx and trachea, few patients require intubation. Few of the patients on whom intubation is performed develop bronchopneumonia, and consequently the death rate is lower.

Tables 8 and 9 show the incidence and the mortality of bronchopneumonia in the series from the Willard Parker Hospital.

Frequency of Intubation.—In this series of forty-two patients on whom intubation was performed, twenty-seven required one intubation; nine, two intubations; three, three intubations, and three, more frequent repetition of the operation. The average number of days the tube was worn was four and two-tenths.

Feeding of Patients on Whom Intubation was Performed.—To assure a sufficient intake of fluids and sufficient nourishment and to

prevent aspiration pneumonia, patients on whom intubation was performed were fed by nasal gavage. The patient was restrained in a mummy dressing; a small caliber, soft rubber catheter was introduced through the nose into the esophagus and stomach, and the proper amount of liquid nourishment was introduced. This feeding was done by the nurse three times during the day and twice during the night. The quantity introduced at each feeding varied from 6 to 10 ounces (170.1 to 283.5 Gm.), depending on the age and condition of the child.

Common complications following intubation are: (1) bronchopneumonia (previously considered), (2) chronic or retained tube and (3) pretracheal abscess (none occurred in this series).

Chronic or Retained Tubes.—Experience has shown that one of about every forty-two cases in which intubation is performed tends to become a "chronic tube" case. This figure was determined by checking the number of threatened "chronic tube cases against the number of cases in which intubation was performed in the Willard Parker Hospital during the past three years and nine months. There were five of the first as against two hundred and twelve of the latter.

An arbitrary period of three and not more than four weeks has been fixed as the longest period for a child to wear an intubation tube. It is assumed that if a child cannot do without an intubation tube in this period, continued intubation and extubation will not solve the difficulty. The larynx needs rest to recuperate from either local ulceration or hyperplastic inflammation. To insure rest for the larynx, low tracheotomy is done. After a proper period of rest, laryngeal bouginage is employed when necessary.

In the present series of forty-two cases in which intubation was performed, one such case occurred. This was in a child, aged 3 years, with laryngeal and tracheal diphtheria. She was examined with the laryngoscope, and on aspiration of the larynx and trachea a complete cast was obtained. Nevertheless, intubation had to be performed. Immediately after each extubation she became cyanosed and reintubation had to be carried out. She was permitted to wear an intubation tube for four weeks and then underwent tracheotomy. As soon as her condition warranted, she was discharged from the hospital. She reported to the laryngologist for bouginage several times each week, and eventually the tracheotomy tube was removed.

CATARRHAL LARYNGITIS

The patients included in this series were those having a nondiphtheritic inflammation of the larynx and sometimes also of the trachea and the bronchi. The local inflammation and the edema were variable. Often there was a characteristic exudate.

The total number of cases in this group was 126. There were 76 males and 50 females, a percentage of 62.2 for males and 40.9 for females. The classification according to age is given in table 10.

The four months having the greatest number of cases were March, April, October and November.

The majority of cases in this group were simple catarrhal laryngitis —the type one sees frequently in children, especially during the months when many adults also have colds. Included in this group were the less frequent but alarming cases of acute laryngotracheobronchitis.

Simple Catarrhal Laryngitis.—There were 104 cases of this classification in the series. The diagnosis in each case was verified by direct laryngoscopic examination and laryngeal culture. In all cases the cultures were negative for the diphtheria bacillus.

The larynx usually was moderately inflamed and slightly swollen. The arytenoids, aryteno-epiglottic folds and the epiglottis were usually

TABLE 10.—*Age and Seasonal Distribution of Catarrhal Laryngitis*

1 year and under	13	
13 months to 2 years	50	
2 years to 3 years	28	93.4%—5 years and under
3 years to 5 years	25	and
5 years to 10 years	9	72.9%—3 years and under
10 years and over	3	

Seasonal Distribution

July	1	January	10
August	8	February	10
September	5	March	23
October	18	April	16
November	14	May	5
December	13	June	3

the seat of the swelling. Occasionally there was moderate swelling of the subglottic region. In some cases there was a thin exudate, which was easily wiped off. Special culture examinations in eighteen of these cases gave the following results:

Streptococcus viridans	6
Nonhemolytic streptococcus	3
Hemolytic streptococcus	2
Staphylococcus	2
Streptococcus viridans and staphylococcus	2
Pneumococci with staphylococci and nonhemolytic streptococci	1

Fifty cases were examined by the roentgen rays. In five, a definite enlargement of the thymus was diagnosed, and two patients were reported to have a slight enlargement. Six of the patients had a follicular exudate of the tonsils, four were moribund, with bilateral bronchopneumonia, and all had either a pharyngitis or a rhinitis or both. The four patients with bronchopneumonia were seriously ill; the broncho-

pneumonia was of the exudative type, and the laryngitis was only a concomitant feature of the terminal stage; it was not the cause of the respiratory embarrassment.

The treatment was simple: rest in bed, steam inhalations and forced fluids. Suction of the larynx was not necessary in any of the cases.

The four patients with terminal bronchopneumonia died. In these the laryngitis was mild, being only a slight inflammation. A great deal of liquid, purulent material was constantly expectorated and bathed the laryngeal mucosa. Excluding the cases of bronchopneumonia, none of the patients with simple catarrhal laryngitis died.

Acute Laryngotracheobronchitis.—In this category only those cases were included in which respiration was seriously hampered. Retractions were marked; there was cyanosis or pallor; the patients were toxic, and the temperature usually was high, about 103 F., or more. There were twenty-two such patients, eleven of whom recovered, a mortality of 50 per cent.

Direct laryngoscopic examination was done in all of the cases, and a culture was taken directly from the larynx and examined for diphtheria bacilli. All cultures were negative for diphtheria bacilli. Special cultures were examined from eight of the cases, and the following organisms were found:

Hemolytic streptococcus	5
Nonhemolytic streptococcus	1
Streptococcus viridans and staphylococcus	1
Streptococcus viridans	1

The laryngeal mucous membrane of the epiglottis, arytenoids and aryteno-epiglottic folds was inflamed; the true cords showed a variable but usually slight redness, while the tissue below the true cords was markedly edematous, sometimes leaving only a small chink through which the air had to be forced. Occasionally there was a thin, whitish exudate which was easily wiped away. The majority of cases had a dirty, greenish-black, gummy secretion or dried plugs of dirty mucus. This gummy secretion collected in the larynx below the cords, in the trachea or in the bronchi.

The treatment of these patients varied. Moisture in the form of steam inhalations was considered desirable, but it could do no good while part of the respiratory apparatus was blocked with the thick, sticky exudate. Therefore, the first consideration was to remove this secretion and thus to ease respiration. Suction of the larynx and trachea was used in the cases with secretion alone and suction with intubation or tracheotomy in cases with exudate complicated by marked subglottic edema.

Suction alone was used in eleven of the cases. It was used in conjunction with intubation in nine cases and with intubation and tracheotomy in two cases. Sixteen cases required only one suction, five required two and one required the operation eight times. The last case occurred in an acutely ill child with marked respiratory obstructive symptoms caused by plugs of dried mucus that formed in the subglottic region. Suction had to be done about every six hours and each time some of the sticky exudate was removed. After each suction, the larynx was painted with 2 per cent mercurochrome-220 soluble. In the culture of the larynx, nonhemolytic streptococci were found. The acute symptoms subsided after the first three days, but the patient remained croupy for about ten days. Eventually all the symptoms cleared up. The same

TABLE 11.—*Results with Suction, Tracheotomy and Intubation*

Treatment	Number	Died	Percentage of Mortality
Suction only	11	7	63.6
Intubation (with suction previously)	9	3	33.3
Intubation and tracheotomy (with suction)	2	1	50
Total	22	11	50

TABLE 12.—*Comparison of Treatment, with Results, in H. Baum's and Willard Parker Hospital Series*

H. L. Baum's Series			Willard Parker Hospital Series		
Treatment	No.	Died	Treatment	No.	Died
Suction only	0	.....	Suction only	11	7 (63.6%)
Intubation	7	1 (14.3%)	Intubation	0	3 (33.3%)
Intubation and tracheotomy	4	1 (25%)	Intubation and tracheotomy	2	1 (50%)
Tracheotomy only	13	8 (61.5%)	Tracheotomy only	0	0
Total	24	10 (41.7%)	Total	22	11 (50%)

treatment—suction followed by applications of mercurochrome—was tried in another case of the same type, but the child died.

It was difficult to diagnose bronchopneumonia in any of these cases because of the obstructed air passages. Roentgen examination verified the observations of bronchopneumonia in four cases and lobar pneumonia in one. Two of the patients with bronchopneumonia and the one with lobar pneumonia died.

Our results with suction, tracheotomy and intubation are given in table 11.

In this connection, I wish to call attention to an aritcle by H. L. Baum.[6] He reported a series of twenty-four cases. It may be interesting to present a comparative table (table 12) of the treatment with

6. Baum, H. L.: Acute Laryngotracheobronchitis, J. A. M. A. **91**:1097 (Oct. 13) 1928.

results in Baum's and in the Willard Parker Hospital series and to draw the inevitable conclusions.

Suction to remove secretion or plugs was performed in all cases of the Willard Parker Hospital series in which intubation and tracheotomy were necessary. It was done in nine of Baum's cases in which tracheotomy was performed and in one of his cases in which intubation was employed. The most favorable mortality in both series is in the patients treated with intubation and suction. The mortality in the tracheotomy series is great, and in the "suction alone" series it is greater.

In the Willard Parker Hospital series the average length of time the intubation tube had to be left in place was longer than in cases of diphtheria in which intubation was performed. Of the six patients who recovered, the tube was in place one, eight, twenty-seven, thirty-five, twenty-one and four days, respectively, while in the patients who died the tube was in place one, two and four days, respectively, giving an average of eleven and two-thirds days.

One patient developed a pretracheal abscess on the twenty-first day after the first intubation. The abscess was drained externally.

OTHER CONDITIONS CAUSING CROUP

The final discussion of the paper will concern other conditions causing croup as follows:

Foreign body	2
Retropharyngeal abscess	3
Polyp	1
Total	6

The series includes two instances of a foreign body. The first was in a child, aged 10 months, who had a piece of chicken bone in the larynx. After removal of the foreign body, the patient was discharged well. The second patient was a girl, aged 2½ years, with two pieces of chestnut shell in the left bronchus. The shells had been there for three days, and the patient had developed a purulent bronchitis and a bilateral bronchopneumonia. She died shortly after the removal of the shells, and the autopsy observations confirmed the diagnosis of purulent tracheobronchitis and bilateral bronchopneumonia.

Three boys, 8, 9 and 10 months of age, respectively, suffering from retropharyngeal abscess, were sent to the hospital with a diagnosis of croup. They had been ill three days before admission, the average rectal temperature being 100 F. Other symptoms were difficult swallowing and normal voice, with a peculiar obstructed breathing, more difficult when the jaws were widely opened. The symptoms increased steadily, and there was a history either of a recent cold or of a swollen cervical

gland. In each instance the abscess was located by digital examination of the pharynx; it was then opened, either a pointed pair of scissors or a pointed hemostat being used. The pus was removed by suction to prevent aspiration pneumonia. Each patient made an uneventful recovery.

A colored boy, aged 5 months, was sent to the hospital because of croup complicating bronchopneumonia. The bronchopneumonia was diagnosed by both clinical and roentgenologic observations. The patient had a peculiar, stridulous breathing which was much improved when he was lying on his abdomen. The larynx was examined with the direct laryngoscope, but nothing abnormal was seen. Roentgen examination of the neck and of the chest was negative for foreign body and enlarged thymus. The patient recovered from the bronchopneumonia. The stridor continued without respiratory embarrassment, and hence the child was sent home. He was readmitted to the hospital a month and a half later, again suffering from bronchopneumonia. He died eleven days after readmission. Autopsy revealed a white bulbous mass attached by a pedicle to the anterior wall of the larynx directly below the vocal cords. One centimeter lower was a smaller mass similarly attached.

It might seem that these polyps could have been diagnosed ante mortem, as they were one of the conditions considered. They probably were overlooked because of their size and color. They were very small and of the same color as the true cords. As the polyps were below the cords, they probably were obscured by the movements of the cords during the direct examination of the larynx.

SUMMARY

1. Direct laryngoscopy with culture is indicated in every case of croup; in only 61.6 per cent of cases diagnosed as laryngeal diphtheria was the diagnosis correct.

2. The incidence of diphtheritic laryngitis was slightly higher for males than for females—56 for males compared with 43.8 per cent for females.

3. The greatest number of these cases occurred in the first four months of the year.

4. Eighty-three and five-tenths per cent occurred during or before the fifth year and 59.9 per cent during or before the third year.

5. In 23 per cent there was no membrane in either the nose or the throat.

6. Tracheobronchial involvement occurred in 12.2 per cent.

7. With suction, only 19.8 per cent needed intubation, while 41 per cent without suction needed intubation.

8. With suction, the mortality in cases in which intubation was performed was 16.6 per cent; without suction, the mortality was 41.6 per cent.

9. With suction, there was found to be practically no danger of blocked tubes.

10. With suction fewer patients developed bronchopneumonia.

11. Suction treatment in tracheobronchial diphtheria gave a mortality of 57.6 per cent; without suction, the mortality was 95.8 per cent.

12. Patients in whom intubation was performed were found to do better when fed by nasal gavage, at least during the first three or four days.

13. Tracheotomy was and should be performed not later than the fourth week of intubation in cases threatening chronicity.

14. Diphtheria antitoxin was found to be most advantageous when given intravenously to patients with laryngeal diphtheria.

15. In the series of patients with catarrhal laryngitis, 62.2 per cent of males and 40.9 per cent of females had catarrhal laryngitis.

16. In 93.4 per cent the cases of catarrhal laryngitis occurred during or before the fifth year of life, while in 72.9 per cent it occurred during or before the third year.

17. The greatest number of cases occurred in the months of March, April, October and November.

18. Patients with simple catarrhal laryngitis recovered with little or no treatment. There was no mortality except when death was caused by some other infection.

19. Enlargement of the thymus may be a concurrent feature in young children.

20. Acute laryngotracheobronchitis produced a high mortality.

21. It was usually caused by some variety of streptococcus, the hemolytic variety being found most frequently.

22. In this infection there was often a thick, dirty, tenacious secretion which formed obstructing plugs.

23. This infection often followed an infection of the upper respiratory tract and sometimes preceded bronchopneumonia or, less frequently, lobar pneumonia.

24. In this, and in H. L. Baum's series, intubation in conjunction with suction to remove plugs was the most favorable method of treatment.

25. Foreign bodies in the larynx, in the trachea or in the bronchi cause symptoms of croup; when in the larynx, they cause symptoms closely resembling laryngeal diphtheria.

26. Polyp formation in the larynx must be considered as a rare cause of croup in children.

ANTIRACHITIC VALUE OF WINTER SUNLIGHT IN THE LATITUDE OF 42° 21′ (BOSTON) *

EDWIN T. WYMAN, M.D.

PHILIP DRINKER, S.B., CH.E.

AND

KATHERINE H. MACKENZIE, R.N.

BOSTON

Authoritative data show conclusively that irradiation with ultraviolet light is of definite beneficial effect in preventing and in curing rickets.

The antirachitic range of the solar spectrum, the wave lengths influencing the deposition of calcium in rickets, is from 290 to 313 millimicrons. That the ultraviolet rays of the sun's spectrum cannot be depended on, however, either to cure or to prevent the development of rickets in all latitudes and at all seasons of the year has also been established, as they vary in intensity during the different seasons of the year, the intensity being highest during the summer months and lowest during the winter months. The ultraviolet rays vary in intensity according to the geographic location, being more intense in the torrid zone than in the temperate zone and at high altitudes than at sea level. The intensity of the short rays is to a large extent dependent on the amount of moisture and dust particles in the air.

In the latitude of 42° 21′ (Boston) under the usual winter conditions of housing and climate, the direct radiations which reach the growing baby, especially when properly clothed, do not suffice to prevent the development of rickets. On account of the cold and consequent loss of body heat during the winter months, direct exposure of naked infants to the sun's rays is not a practical or safe measure in the prevention or cure of this disease.

One of the agents which has received attention in the prevention of rickets in the winter has been the ultraviolet transmitting glass. The types of ultraviolet transmitting glasses which have been more frequently used for this purpose are fused quartz glass, Vitaglass and Helioglass. Window panes made from fused quartz transmit ultraviolet light better than any other known product. The cost of producing it, however,

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makes it prohibitive for general use. The other ultraviolet transmitting glasses (Vitaglass and Helioglass [Vioray]) transmit from 50 to 60 per cent of the total ultraviolet solar rays which are absorbed by ordinary window glass. The average transmissions of these glasses after complete degeneration by a quartz mercury arc is about 30 per cent at a wave length of 302 millimicrons.

Recently, the use of cellulose acetate on a wire mesh has received much attention as a means by which the curative rays of the sun might be obtained. This product is known as Celoglass. It transmits about 30 per cent of the total ultraviolet solar rays which are absorbed by ordinary window glass. It decreases but little in transparency when exposed to the sun, but may change considerably when exposed to varying conditions of weather. Economically, it has a distinct advantage over other products on account of its cost. It has been directly determined by animal experiments that winter sunlight when passed through Celoglass has a distinct antirachitic effect. Wood [1] in Vermont, Bethke and Kennard [2] in Ohio, studies conducted by Council of Physical Therapy of the American Medical Association [3] in Boston and Scott, Hart and Halpin [4] in Wisconsin have demonstrated that winter sunlight when passed through Celoglass prevented weakness of the legs of chicks. It was deemed necessary, however, to supplement those studies with others in which the extent of bone formation was determined and to get an idea of how much irradiation, expressed in acetone methylene blue units, was necessary to bring about normal bone formation. The results of the experiments of Russell and Massengale [5] showed clearly that winter sunlight in the latitude of New Brunswick, N. J., under prevailing weather conditions in the Middle Atlantic States was of sufficient intensity, when passed through Celoglass, to prevent weakness of the legs and to promote normal formation of bone in chicks; and that this result could be obtained with a daily average of a little less than one-fourth unit.[6] Furthermore, it was shown that it is not necessary to give uniform doses every day; the effect of one dose lasts at least a week.[7]

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1. Wood, W. F.: Poultry Science **6**:62, 1926-1927.

2. Bethke, R. M., and Kennard, D. C.: Poultry Science **6**:290, 1927.

3. A Report on Window Glass Substitutes, Council on Physical Therapy, J. A. M. A. **88**:1562 (May 14) 1927.

4. Scott, H. T.; Hart, E. B., and Halpin, J. G.: Poultry Science **9**:65, 1929.

5. Russell, W. C., and Massengale, O. N.: Poultry Science **7**:85, 1928.

6. Massengale, O. N.: Thesis, 1928, p. 60.

7. Russell, W. C.; Massengale, O. N., and Howard, C. H.: J. Biol. Chem. **80**:155, 1928.

In view of the fact that the bones of the chick grow comparatively faster than those of an infant, it was safe to assume that the latter would respond at least as well as chicks to the antirachitic influence of winter sunlight after passing through Celoglass, providing the whole body could be exposed.

Observations previously reported [8] during the winter of 1926 and 1927 in treating rachitic babies with sunlight which had passed through different types of ultraviolet transmitting glasses convinced us that there were sufficient short rays in the sun's spectrum in Boston during the winter months to be of use in the prevention and cure of rickets in children. In our investigation, however, the windows were not ideally situated to give a long exposure to the sun's rays.

Our purpose in this communication is to present studies which have been continued during the winters of 1927-1928 and 1928-1929 on the

TABLE 1.—*Transmissions in Percentage*

Wave Length in Millimicrons	280	302	313	334	365	405
Celoglass						
Unexposed	0.0	30.0	39.5	42.3	44.4	47.4
Exposed Jan. 15 to March 5	0.0	24.4	31.4	34.7	37.4	39.5
Exposed Jan. 15 to Sept. 5	0.0	23.0	27.0	28.0	32.0	....

effect of winter sunlight through Celoglass on the prevention and cure of rickets. The study has consisted (1) of observations on fifteen babies suffering with acute rickets who were exposed to winter sunlight in a specially constructed solarium covered with Celoglass, and (2) physical measurements of sunlight [9] throughout the entire year by Mr. Philip Drinker of the Harvard School of Public Health and (3) biologic studies [10] by Dr. Theodore Wilder on rats exposed to the sunlight in the solarium.

PROCEDURE

The Solarium.—The solarium was situated on the roof of the Infants' Hospital in Boston, and the entire southern exposure was covered with Celoglass. The Celoglass windows were placed at an angle of 60 degrees so that the winter sun's rays, entering approximately perpendicularly to the windows, were reflected as little as possible (figs. 1, 2 and 3). The windows were washed with a hose daily.

8. Wyman, Edwin T.: Boston M. & S. J. **197**:376 (Sept. 8) 1927.

9. Drinker, P.; Thomson, R. M., and Choate, S. P.: Atmospheric Pollution and Sunlight, Transactions of the American Society of Mechanical Engineers.

10. Wilder, Theodore S., and Vack, Christine: Antirachitic Effect of Winter Sunshine Through Celoglass: Results of Experimentation on Rats, this issue, p. 930.

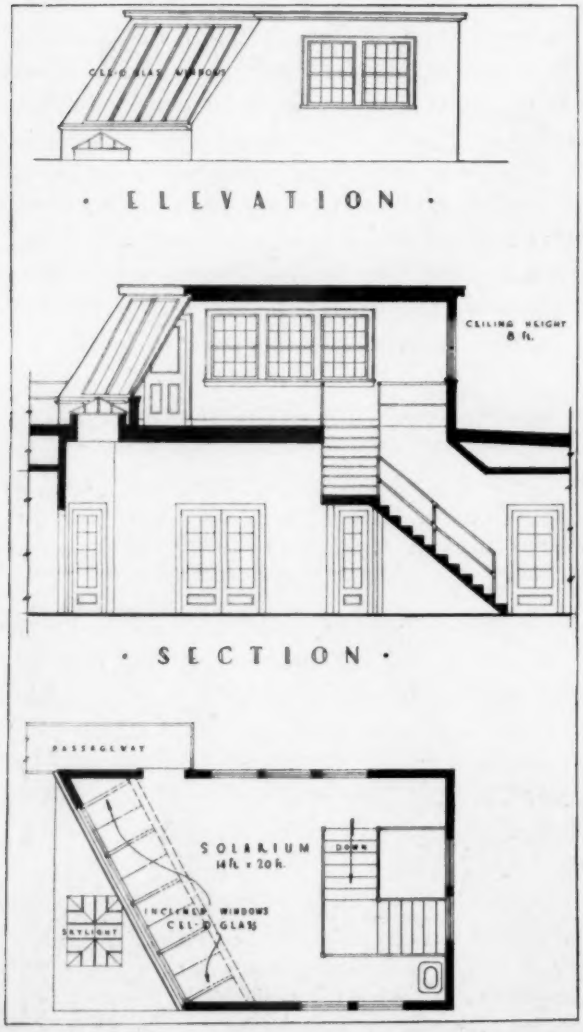

Fig. 1.—Plan of the infants' solarium at the Children's Hospital, Boston.

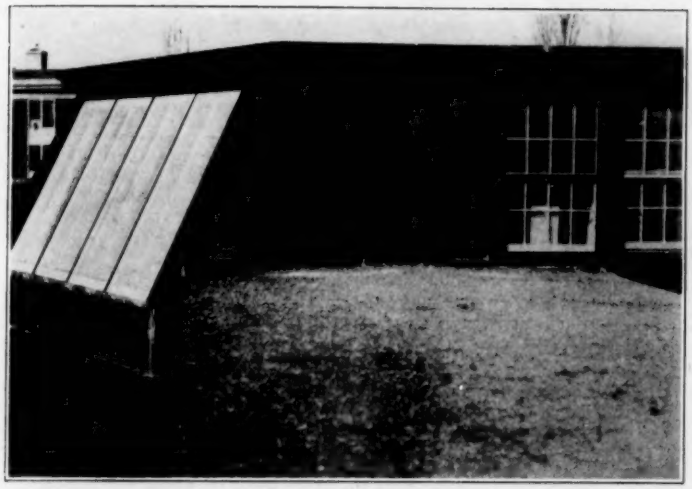

Fig. 2.—Solarium showing the southern exposure of the room covered with Celoglass; the windows are at an angle of 60 degrees.

Fig. 3.—Interior of the solarium showing the arrangement of the cribs.

Fig. 4.—B. R. (left) exposed from January 31 to March 7 and R. D. (right) exposed from February 19 to March 7, during their sun treatments; the skin is markedly tanned compared to that of E. E. (center) before admission to the solarium. The photograph was taken on March 7.

Fig. 5.—R. D. (left) exposed from February 10 to April 15, and J. K. (right) exposed from March 31 to April 15, showing the amount of tanning of the skin. The spot over the abdomen was covered with adhesive plaster during the sun treatments so that no tanning took place on that spot. The photograph was taken on April 15.

In table 1 is given the transmission in the ultraviolet spectrum of three samples of Celoglass, one unexposed and the others exposed in the solarium from Jan. 15 to March 5, 1928, and from Jan. 15 to Sept. 5, 1928, as determined radiometrically by using a quartz mercury lamp, a quartz spectrometer and a vacuum thermopile. These data give the amount of light that entered directly into the spectrometer slit. No correction has been made for the scattered light that did not enter. Were this correction made, it would increase the transmission about 5 per cent. The measurements were made by the Bureau of Standards, Washington, D. C.

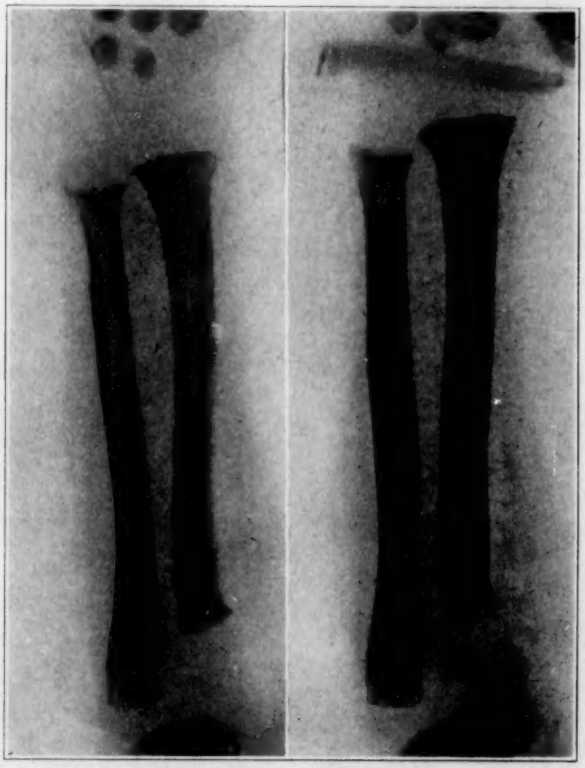

Fig. 6.—Roentgenograms of the bones of the arm of A. F., aged 5 months, whose condition was diagnosed as rickets and spasmophilia. Increased density of the epiphyses and shafts of the bones is seen. The figure on the left shows the condition on Nov. 20, 1928; on the right, on Jan. 19, 1929.

Method of Irradiation.—The temperature of the solarium was maintained at 84 F. when the sun was not shining, and 80 F. when the sun was shining. During the day the infants were naked, except for a sunbonnet to protect their eyes. They were placed about 3 feet from the windows. During December, January and February, their first exposure was one hour (one-half hour to the back and one-half hour to the front) and was increased one hour daily until they were

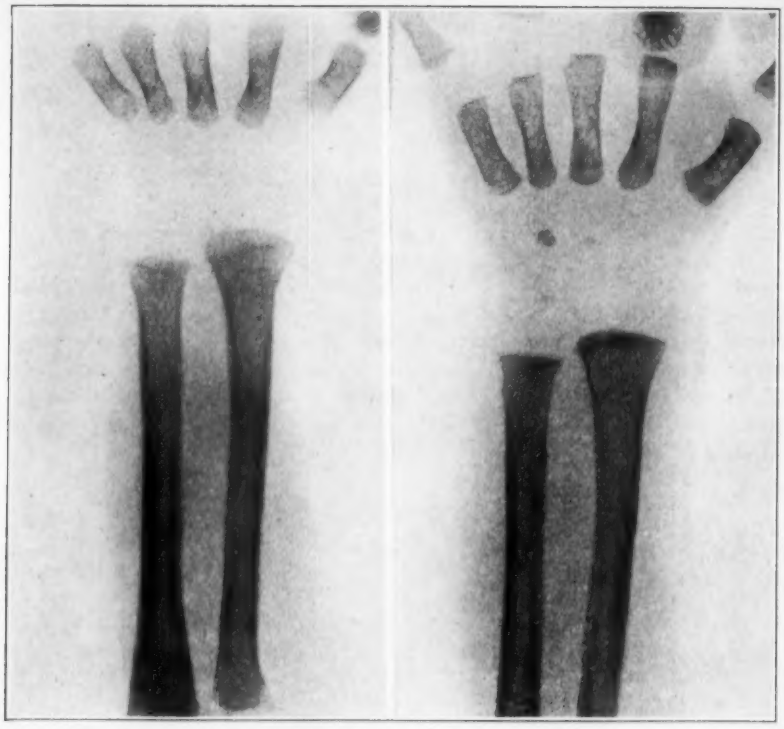

Fig. 7.—Roentgenograms of the bones of the arm of A. M., aged 2 months, whose condition was diagnosed as rickets and spasmophilia. Increased calcification of the epiphyses and shafts with the appearance of the carpal centers of ossification is seen. The figure on the left shows the condition on Jan. 9, 1929; on the right, the condition existing on March 8, 1929.

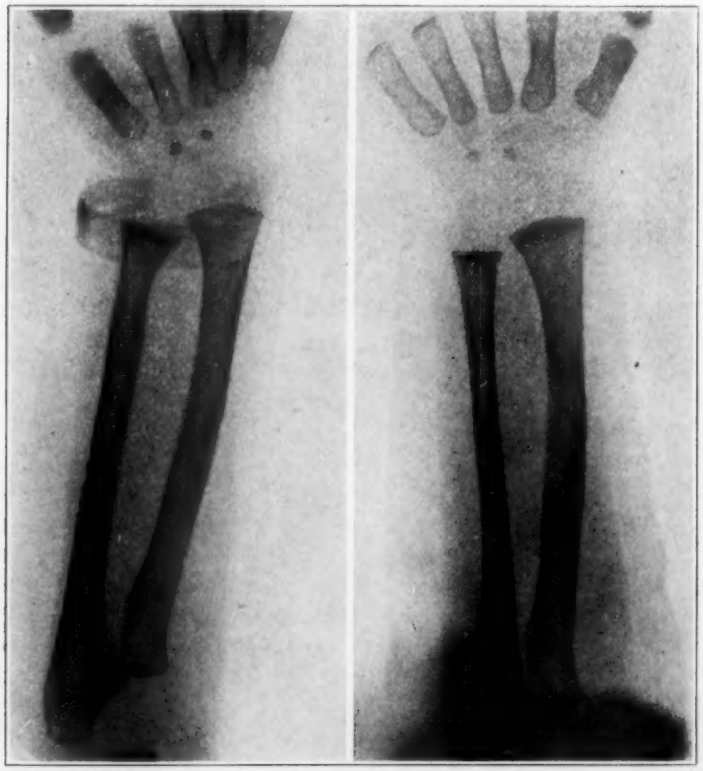

Fig. 8.—Roentgenograms of the bones of the arm of M. S., aged 11½ months, whose condition was diagnosed as rickets. The figure on the right, taken on Feb. 23, 1929, shows marked increase in calcification of the epiphyses and shafts. The figure on the left shows the condition on Jan. 9, 1929.

receiving all the sunshine possible. In some of the darker skinned infants, the exposure could be increased even faster than this without producing erythema. In March and April, when the sun was richer in ultraviolet light, the exposures sometimes had to be decreased, especially during the first few exposures.

In order that such factors as diet and previous antirachitic measures could be controlled so that the effects of light exposure might be determined as accurately as possible, the infants were kept under observation for two weeks before light treatment was begun. They were left as nearly as possible on the diet they

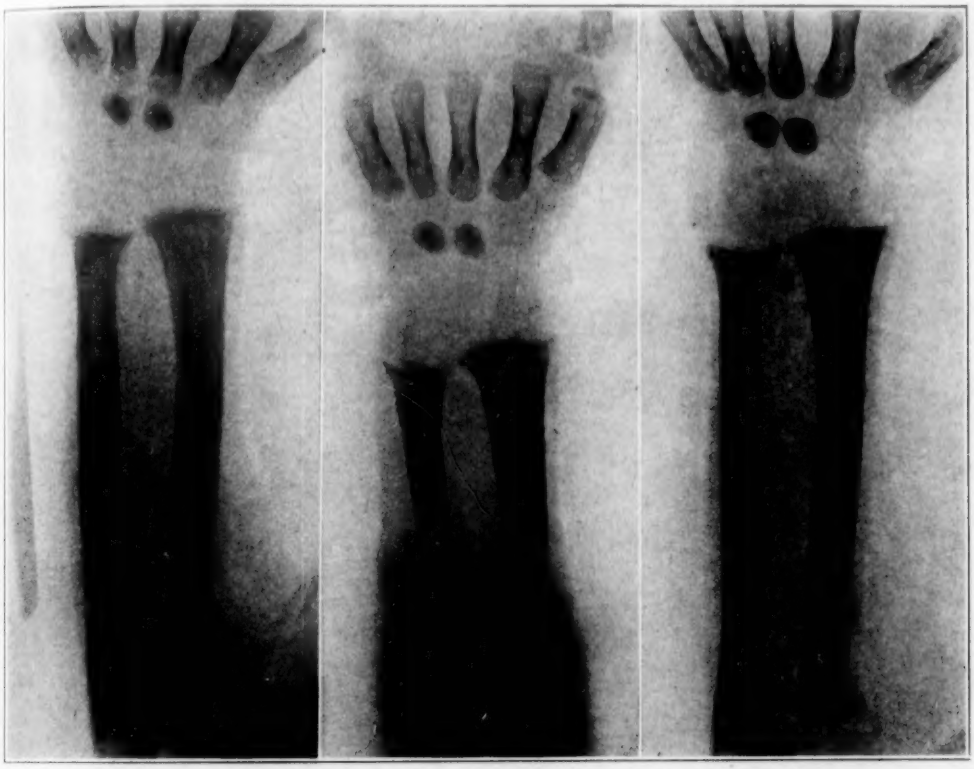

Fig. 9.—Roentgenograms of the bones of the arms of G. K., aged 7 months, whose condition was diagnosed as rickets and spasmophilia. No evidence of healing was seen during the period of observation without antirachitic treatment from January 24 to February 2; then progressive healing was noted until the roentgenogram taken on March 22 showed definite increase in calcification of the epiphyses and shafts with the appearance of another carpal center. The figure on the left shows the condition on Jan. 24, 1929; in the center, on Feb. 2, 1929, and on the right, on March 22, 1929.

received prior to admission to the hospital, with the exception of an increase in the food elements as they gained weight in order to meet their caloric requirements. As could be determined from their histories, none of the infants used in this study had been receiving cod liver oil or any other antirachitic substance.

On admission, roentgenograms of the wrists were taken and calcium and phosphorus determinations made on the blood serum. The concentration of calcium in the serum was made by the Kramer [11] method, with 2 cc. of serum, and the inorganic phosphorus concentration in the serum by the method of Fiske,[12] with 1 cc. of serum. After the preliminary two weeks' observation period, this was repeated, and, if there were no changes in the roentgenograms and blood, the infants were placed in the sun-room. During their stay in the sun-room, roentgenograms were repeated once a week, and calcium and phosphorus determinations of the blood serum were made every two weeks.

Fig. 10.—Roentgenograms of the bones of the arm of M. de W., aged 4 years and 5 months, whose condition was diagnosed as rickets. No evidence of healing during period of observation without antirachitic treatment was shown on the roentgenograms taken from Jan. 19 to Jan. 26, 1928; then progressive increased calcification was noted until the last roentgenograms, taken on March 20, 1929, showed a definite healing taking place and the appearance of two more carpal centers. The figure on the left shows the condition of the patient on Jan. 19, 1928; in the center, on Jan. 26, 1928, and on the right, on March 20, 1929.

11. Kramer, Benjamin: J. Biol. Chem. **47**:475 (Aug.) 1921.

12. Fiske: J. Biol. Chem. **66**:375, 1925.

SUMMARY

An analysis of the results obtained in this study shows:

1. The infants exposed during the months of November, December, January and February became deeply tanned (fig. 4). Those treated after March 1, however, became tanned more quickly (fig. 5).

2. In the majority of the cases, beginning within two weeks of exposure, there was a sustained rise in the phosphorus-calcium ratio (table 2).

TABLE 2.—*The Antirachitic Effect of Sunlight Through Celoglass; Calcium and Phosphorus Ratio Before and After Exposure* *

Name	Age, Months	Hours of Exposure	Periods of Exposure	Calcium		Phosphorus		Product of Calcium and Phosphorus	
				Before	After	Before	After	Before	After
A. F....	5	252	Nov. 16 to Jan. 10..	5.8	11.7	4.1	5.8	23.78	67.86
R. M...	11½	206	Dec. 4 to Jan. 10....	8.4	10.9	2.3	6.5	19.32	70.85
A. M...	2	201	Jan. 11 to March 8..	4.2	10.9	7.3	6.3	30.66	68.67
M. S...	11½	161	Jan. 12 to Feb. 23...	10.2	10.4	3.2	6.1	32.64	63.44
G. K...	7	145	Jan. 29 to March 22	6.6	10.0	4.0	5.7	26.40	57.00
B. R...	5	224	Jan. 31 to March 20	10.4	12.0	2.2	6.9	22.88	82.80
I. DeA..	8½	226	Feb. 2 to March 20..	10.0	11.2	2.5	7.1	25.00	79.52
M. DeW	53	200	Feb. 2 to March 20..	8.3	11.8	3.4	7.7	28.22	90.86
V. C...	6	188	Feb. 4 to April 5....	8.2	9.6	2.9	5.6	23.78	53.76
R. D....	6	220	Feb. 19 to April 20..	8.4	11.6	4.0	7.4	33.60	85.84
J. O....	17	157	Feb. 23 to April 5...	7.6	10.0	2.3	6.2	17.48	62.00
I. D....	20	225	Feb. 25 to March 28	7.4	14.0	2.8	6.4	20.72	89.60
E. E...	15	110	March 22 to May 22	7.0	11.1	4.7	7.8	32.90	86.58
J. K...	12	220	March 31 to May 25	10.5	11.2	2.3	7.7	24.15	86.24
R. H...	14	164	May 12 to June 19..	6.0	10.3	5.0	6.4	30.00	65.92

* In this table the inorganic blood phosphorus and calcium are given in milligrams per 100 cc. blood serum.

3. Deposition of calcium, as shown by the roentgenograms, could be seen following exposure after the second week in all of the cases, with the calcification continuing to increase throughout the period of observation. Roentgenograms of five cases are appended (figs. 6, 7, 8, 9 and 10).

Therefore, it seems justifiable to conclude that infants and children with rickets can be cured by sunshine in Boston (latitude 42° 21′) by exposing them during the months of November, December, January, February and March to sunshine transmitted through Celoglass.

Dr. James L. Gamble directed the calcium and phosphorus determinations for this study, and Dr. E. C. Vogt, roentgenologist of the Children's Hospital, supplied the roentgenograms.

CHRONIC SUBDURAL HEMATOMA IN INFANTS*

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BOSTON

Chronic subdural hematoma has been used as a name to signify a condition more commonly spoken of as pachymeningitis interna hemorrhagica. The latter name signifies infection, but the literature shows no authentic proof of infection as an etiologic factor in this disease. In using the term chronic subdural hematoma, I am following the example of Putnam and Cushing and others who have written on this condition.

Chronic subdural hematoma occurs most frequently in infants during the first year and in adults past middle life. A serosanguineous xanthochromic encapsulated fluid is found under the dura, which condition in infants often causes enlargement of the head, vomiting, irritability, hemorrhages in the eyegrounds, downward displacement of the eyes and symptoms of the central nervous system, the most prominent being convulsions.

One of the first cases on record was described by Ambroise Paré, The case was that of Henry II, who was wounded in a tourney in 1559. Before Virchow's time the condition was recognized, and trauma was given as an etiologic factor. In 1856, however, Virchow described the disease and suggested infection as a cause for the condition. Since that time much discussion has taken place in regard to the etiology. Some investigators maintained that infection was present, while others asserted that trauma was the important factor. The disease was thought to be rare until recently. Finkelstein, in 1904, thought the condition was uncommon and later in 1911 described six cases. Rosenberg, in 1913, described thirty-eight cases, and since that time the literature has included a growing number of case reports. Much of the work has been reported in German and French, but now the English literature also contains many reports in regard to this condition, in some of which the disease is called chronic subdural hematoma and in others, pachymeningitis interna hemorrhagica. The most comprehensive recent work was published by Putnam and Cushing in 1925 and by Putnam in 1927.

In this paper nine cases, one of which came to autopsy, are reported, which clinically form a definite syndrome. These cases were observed within an interval of approximately four years.

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* From the Infants and Childrens Hospital, Boston, and the Department of Pediatrics, Harvard Medical School.

REVIEW OF LITERATURE

The literature on pachymeningitis is extensive. Some of the contributions mentioned have reference to cases in adults, but it was thought wise to include them in order to make the review of this subject more comprehensive.

Prescott Hewett,[1] in 1845, described the pathologic process of chronic subdural hematoma much as it is described today, except that he considered the inner lining of the dura to be the "parietal arachnoid." He did not believe that infection was responsible, and gave hemorrhage which later became encysted as the etiology for this condition. He described the encystation of hemorrhages elsewhere in the body in order to prove this point. Cases in adults were described with symptoms and pathologic changes.

Virchow,[2] in 1857, demonstrated that the lesion of pachymeningitis was subdural and not within the layers of the dura or under the subarachnoid. He believed that the dura was inflamed and that a pseudomembrane was formed as a result. This was rich in blood vessels which ruptured and caused hemorrhages.

Huegenin,[3] in Ziemssen's "Cyclopedia" published in 1877, wrote concerning the pathologic process of this disease and described the various stages in which he believed it occurred. He upheld the theory that hemorrhage was the etiologic factor and was opposed to Virchow's infectious theory. The occurrence of the hemorrhage, he believed, might be due to trauma, but there were many other cases in which degeneration of the blood vessels and venous congestion were of importance. The pial veins were thought to be an important source of hemorrhage. Statistics were given which showed the disease to be present in infants less than 1 year of age in 2.7 per cent of all cases which came to autopsy. After one year there was a falling off in the incidence up to the age of from 30 to 40 years, when it began to increase. The largest percentage of cases occurred in persons between 70 and 80 years of age. Huegenin classed fresh subdural hemorrhage as pachymeningitis and found that in most of his cases the disease ran a course of from one day to six months. He found recovery to be rare, but all of his cases were in adults.

Macewen,[4] in 1885, reported a case in an adult in whom cerebral hemorrhage had occurred after trauma, causing general weakness and especially weakness of the left arm. There was also a right facial

1. Prescott Hewett: Tr. Med.-Chir. Soc. London **28**:45, 1845.
2. Virchow: Verhandl. d. phys.-med. Gesellsch. zu Würzburg **7**:134, 1857.
3. Huegenin, O.: Ziemssen's Cyclopedia, New York, William Wood & Company **12**:386, 1877.
4. Macewen: Lancet **1**:881, 1885.

paralysis, sluggish reaction of the right pupil and slight twitchings of the right facial muscles. Weakness increased over a three months' period. The patient was finally operated on, and a clot was found overlying the right cerebrum. This was removed. Eight months later, the patient was apparently normal.

Bevan Lewis [5] favored the hemorrhagic theory. 1. The cyst is only slightly adherent to the dura. 2. In the majority of cases there is no evidence of pachymeningitis, as the dura is not thickened or vascular. 3. The early pathologic process is simply an extravasation of blood into the subdural space. 4. Vascular disease is often coexistent with this condition to render hemorrhage frequent.

Doehle,[6] in 1890, reported cases of pachymeningitis found in 395 autopsies done on children up to the age of 10 years. Two hundred and sixty-nine of these were done on children less than 1 year of age and 126 on children from 1 to 10 years of age. Of these patients, 48 were found to have pachymeningitis, and of these, 38 were less than 1 year of age and 10 were between 1 and 8 years. Pachymeningitis, then, was found in 14.1 per cent of the children less than 1 year of age and in 8 per cent of the children between 1 and 8 years. No pachymeningitis was found in children in the ninth or tenth year.

Pachymeningitis was not found to be the direct cause of death in any case. It was accompanied by various diseases, such as congenital syphilis in 7 cases, diarrhea in 17, pneumonia in 11, diphtheria in 5, tuberculosis in 1, bronchitis in 2, purulent meningitis in 4 and rickets in 9.

Doehle believed that the membrane was formed by hemorrhage and organization. He stated that injury at birth might be a responsible etiologic agent in many cases, and he suggested that in the blood vessels of the brain there might be lesions which trauma at birth would cause to bleed and in this way produce pachymeningitis. Doehle believed a fatal hemorrhage could result from the bleeding of the blood vessels in pachymeningitis. This however, was unusual.

Cant,[7] in 1891, reported a case of traumatic epilepsy in an adult treated by operation. A large amount of sanguineous fluid and blood clots were removed from underneath the dura, apparently with excellent results in relieving the patient's symptoms.

Wiglesworth,[8] in 1892, objected to the theory of infection as an etiologic factor as proposed by Virchow, for the following reasons: 1. Bleeding often occurs without typical formation of membrane. 2. The dura is roughened by the membrane but strips easily from it, leaving

5. Lewis, Bevan: Textbook of Mental Diseases, London, C. Griffin & Company, 1889.

6. Doehle: Verhandl. d. Inter. Cong., 1890, Berlin, vol. 5, section 17, p. 40.

7. Cant: Lancet **1**:542, 1891.

8. Wiglesworth, J.: Brain **15**:431, 1892.

no signs of inflammation. 3. The membrane resembles an organizing thrombus. 4. At the age at which chronic subdural hematoma usually occurs, arterial degeneration is often present. 5. In fifty cases, twenty were unilateral. Wiglesworth maintained that if infection were present, more cases would have shown pathologic changes bilaterally. 6. The pathologic process is rarely below the tentorium, which prevents extravasation of blood but not infection. 7. Insane and alcoholic patients are likely to develop chronic subdural hematoma, suggesting possible cerebral degeneration. Virchow would not have agreed with Wiglesworth concerning the fact that the pathologic process was not that of inflammation and organization, and that the lesion resembled an organized thrombus. Wiglesworth, however, brings out some salient points against the theory of infection.

Wells,[9] in 1892, reported a case of subdural hematoma in an adult which caused symptoms with the onset three weeks after an injury. The only premonitory symptom was headache after the injury. The patient was cured by the removal of a subdural blood clot.

Robertson,[10] in 1893, in discussing the etiology, suggested a third theory which never received credence. He thought that the spinal fluid pressure in some way became reduced so much that hemorrhage occurred and suggested that the mechanism was similar to dry cupping.

Boudurant,[11] in 1893, reported eight cases in adults which occurred during ninety consecutive autopsies on insane patients. He did not believe in the inflammatory theory, but thought that primary hemorrhage accounted for the lesion. Evidence of endarteritis chronica diffusa was found in some of his cases. In one case, there was a recent subdural hemorrhage; another showed extravasated blood in the subarachnoid space; four cases showed recent extravasation of blood with membranes of earlier date; two showed membranes but no hemorrhages.

Sutherland,[12] in 1894, reported two cases of subdural hemorrhage associated with scurvy, one in a patient aged 14 months and one in a patient aged twenty-four months, but he could not prove that this was more than a coincidence.

Bowlby,[13] in 1895, described a case of epilepsy in an adult due to subdural hemorrhage and mentioned another case with a large subarachnoid cyst which caused no symptoms.

9. Wells, F. L.: M. Rec. **41**:541, 1892.
10. Robertson, G. M.: J. Ment. Sc. **39**:203, 1893; ibid. p. 368.
11. Boudurant, E. D.: Alienist & Neurol. **14**:1, 1893.
12. Sutherland, G. A.: Brain **17**:27, 1894.
13. Bowlby, K.: Surgical Pathology, Chicago, Chicago Medical Book Company, 1895, p. 598.

Ford Robertson,[14] in 1896, discussed the theories put forth explaining the pathologic changes. He believed that primary hemorrhage was responsible for some cases and that other cases resulted from a morbid process in the dura which he found in microscopic sections of the dura in autopsies on the insane. He thought that the theory put forth by Robertson in 1893 was untenable.

Herter,[15] in 1898, reported two cases, one in an infant aged 5½ months and one in an infant aged 22 months. The diagnosis in each case was confirmed by autopsy.

He stated that the majority of cases occurred in patients less than 1 year of age, most of them being in patients less than 6 months.

Ford Robertson[16] in his "Pathology of Mental Disease" admirably described the pathologic changes in pachymeningitis.

He discovered lymph channels in the dura which he thought carried cerebrospinal fluid which seeped through to the subdural space from the subarachnoid space and hence to the blood sinuses via these lymph channels. Interference with this flow, he believed, might cause the degenerative processes he observed in the dura. Robertson also discovered capillaries in the inner layer of the dura which are not ordinarily described. These he believed to be the source of hemorrhage in the degenerated dura.

He suggested again, as he had in a previous article,[14] two theories concerning the etiology of the subdural membranes. One concerned degeneration of the dura, which was found only in the insane, the other, a rupture of a pial vein.

Robertson found membranes in 25.5 per cent of the autopsies done on insane patients and thought that most of them were of recent origin. Five of the hemorrhages originated from pial veins.

Barrett,[17] in 1902, did some careful research in regard to the pathology of this condition. He noted as a fairly constant observation that there was an intravascular separation of fibrin. This observation was best made with Weigert's stain. He found no organisms by staining or cultural methods, which were other than contaminations. The organisms found as contaminants were those that would have caused pathologic changes of a different nature from those found at autopsy. Barrett also implanted pieces of the membrane from the hematomas in the brains of cats and failed to reproduce the pathologic changes of chronic subdural hematoma in this manner. His conclusion was that

14. Robertson, Ford: J. Path. & Bact. **4**:119, 1896.

15. Herter: Am. J. M. Sc. **116**:202, 1898.

16. Robertson, Ford: Pathology of Mental Disease, Edinburgh, William F. Clay, 1900.

17. Barrett, J. O. W.: Brain **25**:181, 1902.

a morbid process in which the essential lesion is a separation of fibrin, to a great extent within the blood vessels, was responsible for this condition.

Starr [18] described the pathologic process in his book in 1903. He thought inflammation of the dura was followed by a thin vascular membrane the vessels of which ruptured to cause a hematoma. He mentioned that some pathologists believed that the hemorrhage came first and that later the clot became adherent to the dura. He described the laminated membrane in connection with the dura found in the insane. He reported a case in a child, aged 9 years, who had hemiplegia after a fall, which was followed by epilepsy. The child was operated on, and a thin, red, velvet-like lining of the dura was found and removed. Recovery took place, and the child had no attacks for two years.

Finkelstein,[19] in 1904, reported a case of pachymeningitis in an infant, aged 7 months. The onset of symptoms began at the age of 6 months. When seen at 7 months, the patient was spastic, the head was enlarged and hemorrhages were present in the retina. The fontanel was bulging. Lumbar puncture showed increased pressure, which quickly sank to a minimum but did not relieve the bulging fontanel. Puncture of the fontanel showed dark hemorrhagic fluid 3 or 4 mm. under the skin. Finkelstein believed that syphilis had played a part in other cases, but found no evidences of it in this case. He stated that intercurrent infections were usually the cause of death, and believed the disease to be rare.

Peter Misch,[20] in 1905, reported two cases in infants. One was in an infant aged 3½ months who died six weeks later with coma, convulsion and hyperpyrexia. Autopsy showed a membrane beneath the dura and 400 cc. of bloody fluid. The patient in the second case was 6 months old and died at 12 months of age with pneumonia. Autopsy showed bilateral pachymeningitis. No fresh blood was present, but the membranes showed organized tissue. They were red and injected in some places and showed brown spots in others. Misch drew no definite conclusions with regard to the etiology.

Göppert,[21] in 1905, reported three cases which he had observed within two years. The onset of the disease in these infants was at 3½, 6 and 12 months. Rickets was present in two cases and tuberculosis in one. Two of the patients died, and one recovered and was well at the age of 2 years. Convulsions were present in all three cases, enlargement of the head was mentioned in two cases and hemorrhages in the

18. Starr, N. A.: Organic Nervous Diseases, New York, Lea & Febiger, 1903, p. 709.

19. Finkelstein: Berl. klin. Wchnschr. **41**:403 (April) 1904.

20. Misch, P.: Jahrb. f. Kinderh. **62**:229, 1905.

21. Göppert, F.: Jahrb. f. Kinderh. **61**:51, 1905.

eyegrounds were mentioned in one case. In one case the onset of symptoms occurred after trauma. Puncture of the fontanel was evidently not done in these cases, and it was thought that lumbar puncture afforded relief.

Finkelstein,[22] in 1905, reported three cases and described the disease. At this time he did not believe the disease to be rare among infants. Colds, bronchitis, tuberculosis and syphilis were thought to be possible factors in the etiology of the disease. Finkelstein divided pachymeningitis into acute and chronic forms, and described one case in which the patient died sixteen days after onset at 3½ months of age as illustrating the former type and two cases in patients aged 6 and 8 months illustrating the latter. In the case representing the acute form, the onset occurred with convulsions. Hemorrhages in the eyegrounds were present in two cases. Puncture of the fontanel was done in the two chronic cases and yielded a bloody fluid. One patient died after an acute onset and two died with pneumonia. Cultures of the spinal fluid and fluid from the cyst gave negative results. The diagnosis of pachymeningitis was confirmed by autopsy in all three cases. Puncture of the fontanel and injection of gelatin were recommended for relief from symptoms. Antisyphilitic treatment was thought to be worth while unless syphilis could be ruled out.

Oppenheim,[23] in 1908, gave a good description of pachymeningitis and mentioned various etiologic agents, among which he named scurvy. No special mention was made of the disease in regard to children, however. Among the therapeutic agents mentioned for relief from symptoms were ice packs, bleeding, laxatives, skull puncture, occasional lumbar puncture and radical removal of the hematoma.

Hahn,[24] in 1911, reported one case of pachymeningitis in an infant 8 months of age which had an onset with convulsions. The head was enlarged, the neck was stiff, reflexes were increased and strabismus was present. Active rickets and bronchitis accompanied the disease. Lumbar puncture showed a bloody sterile fluid. Puncture of the fontanel showed a brownish-red sterile fluid on the second attempt. The eyegrounds showed hemorrhages, and the disks were choked. Injections of gelatin were given, but the infant died. The diagnosis was confirmed by autopsy. Hahn believed that trauma might play an occasional rôle but that a bleeding diathesis was present. He recommended lumbar and fontanel punctures and injection of gelatin for relief.

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22. Finkelstein: Lehrbuch der Säuglingskrankheiten, Berlin, Fischer's Med, 1905.

23. Oppenheim, H.: Lehrbuch der Nervenkrankheiten, Berlin, S. Karger, 1908.

24. Hahn, H.: Deutsche med. Wchnschr. **37**:1518, 1911.

Finkelstein,[25] in 1911, reported six cases of pachymeningitis in small children, in five of which the condition was confirmed by autopsy. Puncture of the fontanel was thought to be necessary to establish the diagnosis. Infection, rickets and trauma were mentioned as etiologic factors. Injury at birth was also thought to be of importance. Injection of gelatin was recommended for relief from symptoms.

Henschen,[26] in 1912, reported the results of 14,659 autopsies and found that 8 per cent of the infants who are born alive but die by the eleventh day die of intracranial hemorrhage, and that 2.27 per cent die without other cause for death except subdural hemorrhage. These statistics are interesting only in relation to the possible effect of injury at birth in producing pachymeningitis and the frequency of the occurrence of such injury.

Meigs,[27] in 1913, reported two cases of pachymeningitis, one in an infant aged 3 months and the other in one aged 4 months. His first patient showed enlargement of the head, right conjugate deviation of the eyes, spastic left arm, convulsions and a temperature of 101 F. No syphilitic process was demonstrated. His second case showed no other symptoms or signs than an enlarged head and failure to gain weight. Autopsy verified the clinical diagnosis. No syphilitic process was found to be present.

Rosenberg,[28] in 1913, reported thirty-eight cases of pachymeningitis in infants. He divided the disease into three types: In the first, the child became restless and there was slow enlargement of the head and separation of sutures; in the second type the nervous symptoms became more acute, the child cried a good deal and convulsions occurred; in the third type the symptoms were fulminating and might come on during a severe illness. Deep coma, severe convulsions and abnormal reflexes might be present. Retinal hemorrhages occurred in one third of the patients observed. Rosenberg considered puncture of the fontanel harmless and important in diagnosis. The course might be from three to five months and the disease might then become arrested. The mortality in his clinic was 60 per cent and resulted mostly from intracranial infections. Rosenberg had seen good results from injection of gelatin as suggested by Finkelstein. He thought that puncture of the fontanel relieved pressure and that measures to build up the general condition to guard against intercurrent infections were of great importance. Rosenberg found capillary damage in the meninges and a fibrinous exudate under the dura. Injury at birth was thought to be of possible

25. Finkelstein: Jahrb. f. Kinderh. **74**:451, 1911.

26. Henschen, K.: Arch. f. klin. Chir. **99**:67, 1912.

27. Meigs, G.: Report of Two Cases of Pachymeningitis Hemorrhagica, J. A. M. A. **61**:2186 (Dec. 13) 1913.

28. Rosenberg: Berl. klin. Wchnschr. **50**:2272, 1913.

importance as an etiologic factor. Nosebleed was noted in twenty-three of thirty-eight cases reported, and in eleven of these the cultures were positive for diphtheria. Eight per cent of the patients had chronic rhinitis. Syphilitic rhinitis was thought to provide the basis for other nasal infections that might be superimposed. As a prophylactic measure, Rosenberg suggested care to avoid grip and diphtheria, signifying that he thought infection important, at least as a terminal manifestation of the disease.

Duperie and Dubourg,[29] in 1913, reported a case of tuberculous meningitis associated with pachymeningitis which was confirmed at autopsy. The pachymeningitis, however, consisted of only a few plaques of membrane and hemorrhage lying underneath the dura bilaterally.

Hada,[30] in 1913, reported a case of pachymeningitis occurring after pertussis in a child 14 months of age. One day before entry the infant was thought to have whooping cough. Six days later, he whooped and on the following day had convulsions. Eleven days after the patient's admission, lumbar puncture showed blood and pus in the spinal fluid. Convulsions continued, and paralysis of various extremities set in. Finally pneumonia and otitis media developed. The patient died five months after entry.

Autopsy revealed thickened meninges and a dura which was thickened and brownish red on its inner surface. The brain substance seemed friable. Hada believed that infectious diseases played a major part in the etiology in pachymeningitis.

Ciarla,[31] in 1913, reported cases of pachymeningitis in 6,631 autopsies and found the frequency to be 0.85 per cent. There was one case in an infant aged 15 months and one in a 10 year old child, both associated with infection elsewhere in the body. The former had pneumonia and the latter tuberculosis.

Wohlwill,[32] in 1913, discussed pachymeningitis and reported several cases in adults and one in an infant aged 12 months, who also had diphtheria and pneumonia. Autopsy revealed a new membrane beneath the dura composed of large blood capillaries and connective tissue. Wohlwill believed that a primary growth of endothelial tissue was responsible for the lesion and thought that hemorrhage or organization were secondary. In traumatic cases and in cases with bleeding diathesis, however, he stated that the lesion suggested organization of a primary hemorrhage. The causes, he thought, were manifold. Trauma at birth was mentioned as a possible factor.

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29. Duperie and Dubourg: Gaz. nebd. d. sc. méd. de Bordeaux **34**:157, 1913.
30. Hada, B.: Virchows Arch. f. path. Anat. **214**:206, 1913.
31. Ciarla: Arch. f. Psychiat. **52**:439, 1913.
32. Wohlwill: Virchows Arch. f. path. Anat. **214**:388, 1913.

Trotter,[33] in 1914, suggested the various steps in the mechanism which caused different symptoms. He believed that in the early stage of chronic subdural hematoma an accumulation of blood might displace the spinal fluid, but that compensation might take place so that no symptoms would necessarily occur. The second stage resulted in cerebral venous congestion due to pressure of the blood clot and this, in turn, caused symptoms of irritability and other related disturbances of the central nervous system. The third stage consisted of capillary anemia resulting from the pressure of the blood clot. Paralysis then occurred but might be transient, as the anemia was relieved from time to time by changes of pressure.

Trotter also stated that trauma was practically always the etiologic agent, and he believed that pachymeningitis hemorrhagica interna was not a good name for this condition. The source of hemorrhage, the writer believed, was the cerebral veins that pass from the brain to the tributaries of the superior longitudinal sinus through the dura.

Trotter did not admit that infection was responsible in any way for the disease. The only etiology other than trauma which he considered possible was some underlying bleeding diathesis which in turn was probably aided by trauma.

Gordon,[34] in 1914, reported two cases of pachymeningitis in young children, one case with hemorrhage and one case without hemorrhage. Retinal hemorrhages were found in the hemorrhagic case. The spinal fluid in both cases was clear without organisms and with a slight lymphocytosis. The Wassermann reactions were negative in both cases. No mention was made of observations at autopsy.

Korwitz,[35] in 1914, reported the results of 5,998 autopsies on stillborn infants and on infants up to the age of 2 years. Of these, 16 per cent showed intracranial hemorrhage.

Intracranial hemorrhage occurred in 25.5 per cent of the stillborn infants; in 26.6 per cent of those that died during the first few weeks of life; in 14.7 per cent of those that died from one to three months after birth; in 10 per cent of those that died between the ages of 3 and 12 months and in 9.4 per cent of those that died during the second year.

Subdural hemorrhages were found to be most frequent, and Korwitz believed that these hemorrhages would develop into pachymeningitis. In 3,875 cases in children from 8 days to 2 years of age, he found pachymeningitic changes in 3.9 per cent. Four cases of pachymeningitis were observed in stillborn infants and nine cases in new-born infants. Korwitz described the pathologic process usually described as pachymeningitis as occurring in these cases which he reported.

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33. Trotter, W.: Brit. J. Surg. **2**:271, 1914.
34. Gordon, A.: J. Nerv. & Ment. Dis. **41**:383, 1914.
35. Korwitz, H. L.: Virchows Arch. f. path. Anat. **215**:233, 1914.

Sachs and Elsberg [36] reported a case in an adult in whom mental symptoms and headache were present for two months after an injury. Then additional trauma occurred, and the symptoms became more severe. Operation was performed, and three months later the patient apparently had completely recovered. A blood clot, membrane and a large amount of bloody fluid were removed from the surface of the right cerebral hemisphere.

Feer,[37] in 1916, reported five cases in infants. The milder cases showed increased intracranial pressure with moderate convulsions, spasticity and irritability. The more severe cases showed stupor, stiffness of the neck, strabismus and bulging fontanel. Lumbar puncture usually revealed bloody or xanthochromic fluid. Puncture of the fontanel showed bloody fluid a few millimeters below the skin. The disks were often choked. Cobweb-like hemorrhages were present in the retina. One patient developed facial paralysis and one developed hydrocephalus and was blind in one eye. In most cases healing was thought to occur. No cases were associated with syphilis, diphtheria or trauma. Hemorrhagic diathesis was thought to be a possibility in one case. The diagnosis was made by a bloody sterile spinal fluid and a bloody fluid obtained by puncture of the fontanel and by cobweb-like hemorrhages in the retina, observed in four or five cases.

Heuer and Dandy,[38] in 1916, reported a case of pachymeningitis in a man, aged 26, without any history of trauma. The lesion was unilateral, covering one cerebral hemisphere. The pathologic process described coincided with the description of other lesions of this sort. The symptoms were: change of disposition, headache, loss of vision and occasional vomiting.

Schwartz,[39] in 1916, cultivated meningococcus from the fluid of a case of pachymeningitis in an infant aged 5 months. He quoted Schottmüller of Munich, who reported the disease following streptococcus septicemia, and who was inclined to believe that infection was the agent responsible for this condition. He thought pachymeningitis and leptomeningitis were manifestations of the same process. Organisms other than the meningococcus, however, were thought to be able to produce the disease.

Sachs,[40] in 1920, suggested that injuries at birth of infants who survive may form the foundation of future chronic subdural hematomas.

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36. Sachs, B., and Elsberg: New York M. J. **104**:633, 1916.
37. Feer: Cor. Bl. f. schweiz. Aerzte. **46**:1148, 1916.
38. Heuer and Dandy: Bull. Johns Hopkins Hosp. **27**:224, 1916.
39. Schwartz, A. B.: Pachymeningitis, Am. J. Dis. Child. **11**:23 (Jan.) 1916.
40. Sachs, E. V.: Review of Eight Years' Experience with Brain Tumors, Arch. Surg. **1**:74 (July) 1920.

Rosenberg,[41] in 1920, discussed pachymeningitis and mentioned the fact that it was ushered in by hydrocephalus and disturbance of the central nervous system. Lumbar puncture was thought to help but little in the diagnosis, as the cyst did not communicate with the subarachnoid space. Occasionally, however, it caused a xanthochromic spinal fluid. Invasion of the lesion by bacteria and the resulting purulent meningitis were mentioned. Sequelae in ten cases were as follows: two idiots, three imbeciles, one person with a neuropathic constitution, one stutterer, one bedwetter and two normal subjects. Two of the affected patients also showed atrophy, two impaired vision and one facial paralysis.

Rosenberg,[42] in 1921, wrote a monograph on pachymeningitis, in which he described two types. One was called the traumatic or regressive type and the other the idiopathic or progressive type. He found no evidence of infection in either type, except that due to complications.

Clinically he described three groups of cases. The first was a latent or beginning form. The second showed acute symptoms due to cerebral pressure and the third was a violent, rapidly progressing form. Seven cases were reported in patients between the ages of 3 and 6 months in the first group, eight cases in infants in the second, and four cases in infants in the third. The prognosis in the third group was thought to be bad. If a patient recovered in any group, the course was from two to five months.

Symptoms and sequelae were discussed at length. Symptoms of the central nervous system were prominent, and enlargement of the head was a common physical observation. The cranial nerves were involved in 33 per cent of the cases, and the muscles of the eye were especially likely to be involved. Nystagmus was the most common change in the muscles of the eye. Retinal hemorrhages were noted early in the disease, and changes in the disk were reported in a previous paper by Rosenberg [41] in 1920, with the addition of aphasia, protrusion of the tongue, strabismus, grimaces, tremor and twitching.

Meningitis was a common occurrence and was present in nine cases. The tubercle bacillus, streptococcus, colon bacillus and pneumococcus were responsible. In one case the patient was infected by puncture of the fontanel, but the infection was thought to travel usually from the nose by the way of the lymphatics to the brain.

Four cases of congenital syphilis were present among the cases reported. Diphtheria was mentioned as a source of infection. Thrombosis of the cavernous sinus was frequently found. No cases were observed among carefully breast-fed infants, and Rosenberg thought that the disease was much more likely to occur among poorly nourished infants.

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41. Rosenberg: Deutsche med. Wchnschr. **46**:1348, 1920.
42. Rosenberg: Ergebn. d. inn. Med. u. Kinderh. **20**:549, 1921.

The therapy consisted of building up the resistance, puncture of the fontanel and possibly injection of gelatin.

The prognosis was thought to depend on the occurrence of intercurrent infection, as pachymeningitis itself seldom caused death.

Dunn,[43] in 1922, reported five cases in adults under the heading of pachymeningitis. These cases, however, were not definitely proved, and frank hemorrhage rather than the pathologic changes of pachymeningitis may have been responsible for the symptoms. Syphilis was not found to be a factor except possibly in one case.

Burhans and Gerstenberger,[44] in 1923, reported five cases in infants from 2 to 20 months of age in which trauma was thought to be an important etiologic factor and in which syphilis was thought to be a negligible etiologic factor. Retinal hemorrhage was present in four of five cases. Puncture of the fontanel confirmed the diagnosis of hemorrhage over the cerebrum in three cases. The fontanel was bulging in two cases. Enlargement of the head was thought to be present in one case. One case was especially interesting as the infant had symptoms of cerebral hemorrhage at birth. He later recovered and then experienced a fall after which symptoms of pachymeningitis occurred. Observations post mortem were reported in one case; these were typical of chronic subdural hematomas.

Fried,[45] in 1924, reported a case in an adult which may have been similar to those reported by Neal in 1926 mentioned subsequently. His patient had a sudden onset of symptoms of the central nervous system. Two lumbar punctures were done, and both showed bloody fluid. These relieved the patient, who recovered after three weeks. It seems hardly fair to assume that the pathologic process of chronic subdural hematoma was present in this case. Fried believed this condition to be rare in infancy, but particularly during the first to the twenty-first year of life.

Stephenson,[46] in 1924, reported a case in which the condition was diagnosed clinically as pachymeningitis in an adult who also had syphilis. He believed that syphilis, as well as other factors including trauma, might be responsible for pachymeningitis.

Swift,[47] in 1925, reported six cases in adult patients in which the condition was diagnosed pachymeningitis. All of these patients recovered. Four were said to be due to infection, although no reports on cultures from spinal fluids were given. One case was said to be due to syphilis because the Wassermann reaction was positive.

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43. Dunn, A. D.: Am. J. M. Sc. **163**:819, 1922.

44. Burhans, C. W., and Gerstenberger, H. J.: Internal Hemorrhagic Pachymeningitis in Infants, J. A. M. A. **80**:604 (March 3) 1923.

45. Fried, H.: M. J. & Rec. **119**:149, 1924.

46. Stephenson, J. W.: M. Clin. North America **9**:379, 1924.

47. Swift, G. W.: Northwest Med. **24**:232, 1925.

Putnam and Cushing[48] published an important paper on chronic subdural hematoma in 1925. They thought insignificant trauma might cause this condition. Two types were mentioned: (1) reactive or traumatic and (2) spontaneous. In the first type, there were large mesothelial-lined spaces which connected with capillaries but contained few or no red blood cells. The second type showed giant capillaries which were connected with one another. Mesothelial-lined spaces were few. Fibrosis was present near the dura, and mesothelium covered the portion of lesion approximate to the subarachnoid. They found no neoplastic or inflammatory tissue and suggested that the second type might be the chronic form of the first type. In their experience the onset of symptoms might be delayed days or months from the time trauma was experienced.

Chambers,[49] in 1925, reported a case in which the condition was diagnosed pachymeningitis in connection with mastoiditis and chronic abscess of the brain. The description of the pathologic changes, however, did not correspond to that usually ascribed to this disease.

Debré and Semelaigne,[50] in 1926, reported five cases of pachymeningitis and two other cases of suspected pachymeningitis in infants observed during a five year period. They mentioned sequelae occurring in their patients after recovery. These were unilateral amaurosis, external hydrocephalus with muscular spasm and strabismus. Some of these sequelae occurred in all patients except one who was 5 months old and who appeared normal two months after recovery. One patient had chorioretinitis, another had a syphilitic father, another had a positive Wassermann reaction and clinical evidence of syphilis, and still another had a positive Wassermann reaction and a mother who had a positive Wassermann reaction. Syphilitic treatment in the last three patients seemed to be beneficial. Lumbar puncture helped to relieve symptoms.

Holmes,[51] in 1926, reported a case of chronic subdural hemorrhage in an adult produced by trauma which he considered to be the same disease as pachymeningitis.

Cabot,[52] in 1926, discussed a case of pachymeningitis in an adult which developed after trauma. The pathologic process consisted of a sac containing bloody fluid and purulent material which was sterile on culture. There were no laminations in this lesion. Operation apparently caused improvement in the condition of the patient.

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48. Putnam, T. J., and Cushing, H.: Chronic Subdural Hematoma, Arch. Surg. **11**:329 (Sept.) 1925.

49. Chambers, T. R.: J. M. Soc. New Jersey **22**:209, 1925.

50. Debré and Semelaigne: Pachymeningitis in Infants, Presse méd. **34**:337, 1926; abstr., J. A. M. A. **86**:1488 (May 8) 1926.

51. Holmes, W. H.: M. Clin. North America **9**:1558, 1926.

52. Cabot: Boston M. & S. J. **194**:592, 1926.

Neal,[53] in 1926, reported thirty-five cases of meningeal hemorrhage in which operation was not performed. The patients in twenty-one of these cases recovered. The etiology was obscure in all cases. Postmortem examination on one patient, aged 18 years, showed pathologic changes described as pachymeningitis. Postmortem examinations in other cases showed hemorrhages in the pia in one and hemorrhage into the ventricles in two. Some of these cases might have developed into pachymeningitis, and Neal thought that perhaps the various observations were made during different stages in pachymeningitis. There were four patients less than 2 years of age, but two of these had epidemic meningitis, and the cause of bleeding was unknown in two. Three died.

Putnam and Putnam [54] carried on experiments in which they injected blood under the dura, but they could not produce a chronic subdural hematoma which had a progressive course. The lesion produced was similar to that in pachymeningitis as it showed mesothelial lined spaces, a mesothelial covering and granulation tissue. The course of the lesion, however, was not progressive and in this respect was different from chronic subdural hematoma.

Griswold and Jelsma,[55] in 1927, reported seven cases of pachymeningitis in adults. Three of these had histories of trauma. Three others were users of alcohol, and one of the three had a positive Wassermann reaction. In one case the history was not given. These observers thought that a history of trauma was likely in all cases if it could be elicited, but added that a predisposing vascular lesion might be important in aiding trauma to cause hemorrhage.

Rand,[56] in 1927, described the pathologic changes and reviewed the article by Putnam and Putnam. He mentioned the variability of the symptoms and the various kinds of injury both mild and severe that might cause symptoms. He said that many cases were found in insane asylums, and that jacksonian attacks were sometimes present. Seven adult cases were reported, all of which had a traumatic background. In three of these cases the patients had convulsions, and the latent period from the time of trauma to the onset of symptoms varied from one to seven months. Rand agreed with Trotter that the pial vessels were the source of the hemorrhage. Five patients recovered and two died. Good results were obtained from the removal of the cyst. In advanced cases a high percussion note was present over the calvarium, and the disks showed choking.

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53. Neal, J. B.: Spontaneous Meningeal Hemorrhage, J. A. M. A. **86**:6 (Jan. 2) 1926.

54. Putnam, T. J., and Putnam, I. K.: J. Nerv. & Ment. Dis. **65**:260, 1927.

55. Griswold, R. A., and Jelsma, F.: Relationship of Chronic Subdural Hematoma and Pachymeningitis Hemorrhagica Interna, Arch. Surg. **15**:45 (July) 1927.

56. Rand, C. W.: Chronic Subdural Hematoma, Arch. Surg. **14**:1136 (June) 1927.

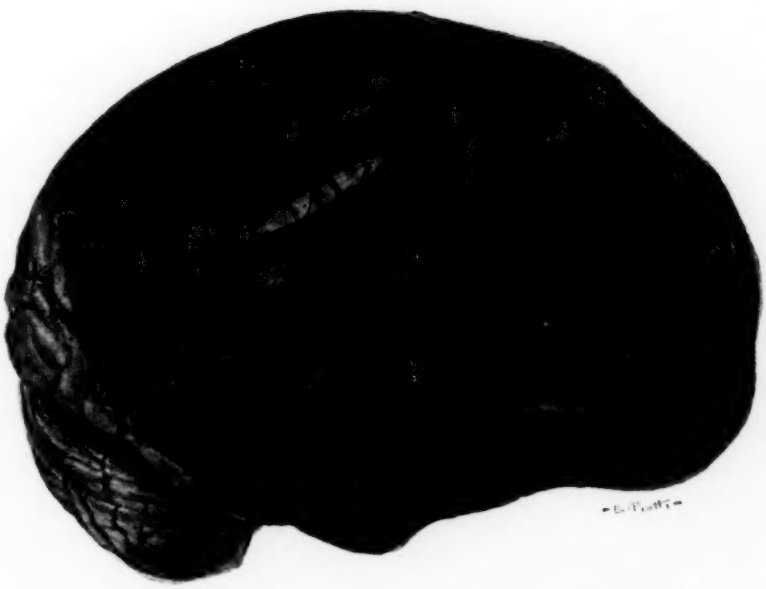

Fig. 1.—Picture made at autopsy showing dura, subdural membrane, clot beneath subdural membrane and brain substance under clot.

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Dietrich,[57] in 1927, discussed the etiology of pachymeningitis, and stated that trauma at birth and infectious diseases were important in children.

Kernbach and Fisi,[58] in 1927, described a case in a child, aged 18 months, who died within a short time. There was no evidence of trauma. Autopsy revealed pachymeningitis and similar changes were also present in the spinal dura. Acute hemorrhagic nephritis was present and it was suggested that the pachymeningitis might be considered a part of a generalized infection.

Holmes,[59] in 1928, reported two cases in an article in which he discussed the disease. In both of his cases the condition was the result of trauma, and he believed that trauma was invariably present as an etiologic factor. He used the term "chronic subdural hematoma" to describe the disease and maintained that pachymeningitis was merely a name used to signify belief in the infectious theory of Virchow and of the older pathologists. He stated that hemorrhage in the spinal fluid indicated that the subarachnoid space had been involved and that the hemorrhage had not become encysted. Holmes described three stages of symptoms that occurred as the disease progressed which might be compatible, roughly, with the mechanism of the disease suggested by Trotter in 1914.

Craig,[60] in 1928, in an editorial mentioned the importance of the latent period during which no symptoms occurred after trauma. He believed operation offered hope of success and suggested that a history of trauma was of great significance.

Glauber,[61] in 1928, reported four cases observed in three months. The first case was that of a child aged 2 years with an intellect of a child aged 3 months. Development was apparently normal until the age of 18 months. Marked rickets, enlargement of the head and bradycardia were present. He had refused food and had a subnormal temperature. The clinical diagnosis was internal hydrocephalus. Lumbar puncture showed a bloody fluid. Autopsy showed a thickened dura with fresh hemorrhages in some places and brownish discoloration in others.

The patient in the second case was 12 months of age and showed convulsions, paralysis, coma, reflex changes and bloody fluid on puncture of the fontanel. Autopsy showed pachymeningitis which was infected.

57. Dietrich: München med. Wchnschr. **74**:1436 (Aug.) 1927.

58. Kernbach, M., and Fisi, V.: München med. Wchnschr. **74**:1521 (Sept.) 1927.

59. Holmes, W. H.: Chronic Subdural Hemorrhage, Arch. Neurol. & Psychiat. **20**:162 (July) 1928.

60. Craig, W. M.: Surg. Gynec. Obst. **47**:728, 1928.

61. Glauber: Monatschr. f. Kinderh. **38**:293, 1928.

The third patient was 21 months of age. The clinical diagnosis was pachymeningitis interna hemorrhagica, and this was confirmed at autopsy.

The patient in the fourth case was 3½ months of age. Three cubic centimeters of xanthochromic fluid containing fresh and crenated red blood cells was recovered from puncture of the fontanel. Pachymeningitis was found at autopsy.

Glauber stated that diagnostic methods such as encephalography and punctures of the fontanel might be the cause of a hematoma under the dura. Injury at birth was given as a possible factor, and angiodystrophy was not thought to be an unlikely etiologic agent.

ANATOMY AND PATHOLOGY

The dura is composed of fibrous tissue which is supplied by nerves, blood vessels and lymphatics. It has two layers made of parallel connective tissue fibers, and these layers separate to form the blood sinuses found in the dura.

The dura receives its blood supply, according to Cunningham's textbook of anatomy, from small vessels entering its upper layer. These are connected with the blood vessels that supply the skull or with vessels outside the dura, such as the middle meningeal artery. The blood vessels of the dura are small and are most numerous in the outer layer, according to Cunningham.

The dura also carries the blood sinuses and the pial veins which empty into them. The latter are sometimes found in the dura some distance from their connections with the blood sinuses. Cunningham made no mention of the fact that these vessels nourish the dura in any way. The only blood supply, then, appears to be from the small blood vessels entering from without. These vessels and strands of fibrous tissue make the dura adherent to the skull. This is much more noticeable in infancy and old age than in middle life.

The only other blood vessels of the dura have been described by Ford Robertson in the "Pathology of Mental Disease." He found a rich network of blood vessels in the inner layer of the dura by making horizontal sections and believed these vessels to be important in contributing to the hemorrhage in chronic subdural hematoma. Robertson also described lymph channels in the dura which he believed emptied into the blood sinuses. The vessels described by Robertson are not mentioned by most anatomists.

In the subdural space, which is really only a potential space between the dura and the arachnoid, there is only enough fluid to moisten the under surface of the dura and the upper surface of the arachnoid. This fluid, according to Cunningham, finds its way into the blood sinuses of the dura by absorption through that part of the dura which covers the

pacchionian bodies. Robertson believed that the fluid in the subdural space seeps through the arachnoid membrane from the subarachnoid space and then is carried by the lymphatics, which he observed in the inner layer of the dura, to the blood sinuses.

As a possible source of hemorrhage into the subdural space one might imagine a morbid process in the dura covering the pacchionian bodies which would allow blood from the superior longitudinal sinus to enter the subdural space. Another source, according to Robertson, is the small veins that he found in the inner layer of the dura. He believed that these are the source of hemorrhage where a morbid change takes place in the dura. The only other place from which hemorrhage seems likely to occur is a pial vein, and this is the source of hemorrhage that seems to be generally accepted in chronic subdural hematoma due to trauma. It is conceivable that hemorrhage might occur from any of these three sources. It seems unlikely that the small vessels in the outer layer of the dura contribute to the hemorrhage, and it is also rather difficult to believe that the rupture of a pial vein would involve the subdural space alone without causing hemorrhage into the subarachnoid space as well. That the latter space is often involved is suggested by bloody fluids obtained by lumbar punctures early in the disease; these fluids frequently become clear later, as the hemorrhage is presumably walled off.

The pathology has been described by many writers since Virchow's time. Ford Robertson in 1900 [16] did careful work on the pathology of this condition. Putnam,[48] in 1925, reviewed reports of various pathologic observations by different investigators, and his paper should be consulted for a more detailed report in regard to the pathologic anatomy. The description of the pathology given in this article is taken largely from Putnam's paper.

Putnam divided the chronic subdural hematoma into two types, which he called (*1*) vascular or spontaneous and (*2*) reactive or traumatic. The former term is applied to those hematomas which apparently occur spontaneously without known cause and the latter to those which occur after a definite history of trauma. These two types differ histologically as well as with respect to the clinical history, but also have many peculiarities in common.

The location of the chronic subdural hematoma in the proved cases was bilateral. In six cases it was found to be bilateral by subdural taps. In two cases no mention was made as to the side on which the tap was done, and in one case only the right subdural space was tapped. In six cases, then, the lesion was bilateral, and in three cases the evidence is insufficient, but there are no data to influence one to believe that the lesion was unilateral in any of these three cases. None of the patients

was operated on; so nothing is known of the extent of the lesion, except in the one case that came to autopsy. In this case the lesion was bilateral and covered a large part of each cerebral hemisphere, extending from the anterior parts of the frontal lobes and overlapping the parietal lobes to the anterior parts of the occipital lobes.

The size of the hematoma may vary within wide limits according to Putnam. From the amounts of fluid withdrawn in some of the cases reported and from the observations at a single autopsy, one might be led to suspect that hemorrhages were inclined to be large in infants.

The usual gross appearance of the chronic subdural hematoma is that of a sac immediately beneath the dura enclosing a large or small quantity of bloody, xanthochromic fluid. Many variations occur. Sometimes membranes are found without any fluid, and sometimes a thin, vascular, velvety membrane is found underlying the dura, without fluid being present.

The membrane forming the sac has a definite structure on both the dural and the arachnoid side. The membrane on the side of the sac in proximity to the dura is usually adherent to the dura, but can readily be stripped off, while that in proximity to the arachnoid is usually free from adhesions. The case reported herein which came to autopsy showed a definite sac which was not adherent to the arachnoid and only slightly adherent to the dura. The membranes on each side enclosed a large amount of bloody, xanthochromic fluid. The contents of the membranes may vary from a bloody xanthochromic fluid to a xanthochromic fluid with no gross blood. The contents of the clot enclosed by the membranes may consist of organized tissue, a fibrin mesh or a large collection of serum and red cells with no fibrin.

MICROSCOPIC OBSERVATIONS

Putnam did not find the laminated appearance of the membrane under the dura (subdural membrane) which is usually described. The appearance of the subdural membranes varied, but did not occur in regular layers. The essential differences in the two types which he described were found in the subdural membranes. On the arachnoid side of the clot there is a thin layer of connective tissue covered by mesothelium. The mesothelium is next to the arachnoid.

The subdural membrane in Putnam's traumatic type varied in thickness from 1 to 4 mm. It was composed of well formed fibrous tissue which was clearly marked off from the dura. It was less clearly marked off from the clot beneath, into which strands of connective tissue penetrated. Capillaries were noted in the fibrous tissue, but no fibrin was found in the capillaries as noted by Barrett [17] in 1902. The characteristic feature of the membrane was the presence of large mesothelial-lined

spaces which contained red blood cells, lymphocytes, fibrin and granular débris. These spaces anastomosed with each other and with the capillaries, as was shown by Putnam in microscopic sections.

The spontaneous type showed fibrous tissue which was well demarcated from the dura but which differed from the traumatic type in that giant capillaries filled with red blood cells were present. The smallest capillaries in this type were comparable to the largest ones found in the traumatic type. Mesothelial-lined spaces, which were numerous in the traumatic type, were seldom found and were small when they did occur. The fibrous tissue in the spontaneous type appeared older and firmer and was more sharply demarcated from the clot beneath than in the traumatic type. In the latter, a hematoma was always found underneath the subdural membrane, while in the spontaneous type the membrane most often occurred without the hematoma. Ford Robertson [16] described degenerative changes in the dura occurring with chronic subdural hematoma and often observed membranes without underlying clots in these cases. Putnam found no marked change in the dura in his cases; he found the pia and arachnoid normal in one case studied microscopically, but observed slight thickening of the arachnoid grossly in other cases.

Deformities of the brain occur owing to pressure. Trotter [33] suggested that pressure might cause obliteration of the capillaries, which in turn would cause changes in the brain. Microscopic changes in the brain have not been observed, however, as the undoubted result of pressure from a chronic subdural hematoma. Roentgenograms of the bones of the skull have shown changes due to pressure in some cases. This was not true in the cases reported, as the pressure was partially compensated for by spreading of the sutures and enlargement of the fontanel. The eyegrounds frequently show hemorrhages. This was noted in four of the nine cases reported, but in two cases they were not examined. The pathologic changes in other parts of the body are of no interest in connection with chronic subdural hematoma.

In conclusion, it seems that the pathologic process in chronic subdural hematoma may vary considerably. If morbid changes such as those described by Robertson occur in the dura, the pathologic changes are likely to be different in some respects from those described by Putnam in his traumatic type; indeed, the source of the hemorrhage may be different also. In the former the small blood vessels of the dura may be responsible, and in the latter a pial vein may be the source. Putnam suggested that the type he called traumatic may progress into the type he has called spontaneous or vascular. Robertson, however, offered two causes to account for the pathologic process. One was a degeneration of the dura, which he held responsible for bleeding or the formation

of a vascular, velvety membrane under the dura, and the other was a rupture of a pial vein. Variations in the pathologic picture, it must be recognized, are not uncommon, and it may be that two or possibly more different lesions, perhaps due to different etiologic agents, are being grouped under one heading. The term chronic subdural hematoma is descriptive, however, and, even though different forms occur, it seems permissible for the present to group them under this title.

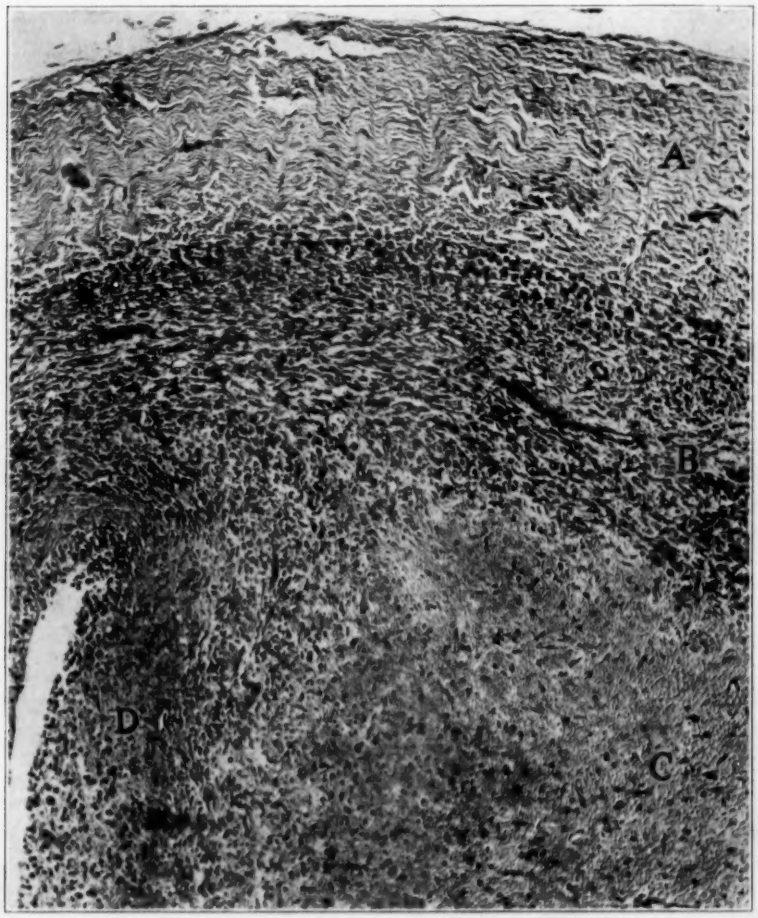

Fig. 2.—Section through dura and blood clot, including a small portion of cyst membrane. *A* indicates endosteal layer of dura; *B*, inner or meningeal layer of dura and attached portion of cyst envelop; *C*, area of hemorrhage; and *D*, attached portion of cyst wall. (Dr. Ruben Z. Schulz.)

Necropsy in Case 6.—Macroscopic Observations: A complete necropsy performed by Dr. Ruben Z. Schulz two hours post mortem showed a bilateral terminal bronchopneumonia, *Bacillus coli* meningitis and an organizing subdural blood clot. The pathologic changes in the body were of minor importance and need not be

further described. The dura was of greatest interest because of a blood clot which covered the coronal aspects and extended over the lateral surface of the frontal, parietal and occipital lobes, but did not involve the tentorium, the dura at the base of the skull or the falx cerebri. The blood clot on the right and left sides were of equal magnitude. Their appearance was that of a thin, membranous envelop filled by a turbid, brownish to brownish-red fluid. This membranous envelop could readily be stripped from the dura to which it was uniformly adherent. Just beyond the site where the deep investure of the cyst and the attached portion of the dural membrane were in contact at the outer border of the hematoma, there were a number of areas of old and recent hemorrhage. The most extensive areas of recent hemorrhage were found along the occipital border of the hematoma. These areas did not apparently connect with the large cystic cavity.

Microscopic Description: Microscopic sections from these areas showed a fairly normal endosteal layer of dura with no evidence of degeneration. The meningeal or deep layer of the dura had adherent to it a mass of old and new fibrous tissue showing hemorrhage and an acute inflammatory reaction. This inflammatory reaction obscured the attachment of the cystic envelop to such an extent that it was impossible to separate the two histologically. The deep or free layer of the envelop likewise was involved in the acute inflammatory process consisting of a heavy infiltration of polymorphonuclear leukocytes and a deposit of fibrin. The deep layer also contained some rather old fibrous tissue near its junction with the attached portion of the envelop. In a few areas the deep portion of the membrane appeared to have a single layer of cells covering it. In the major portion, however, it was either destroyed or obscured by the inflammatory reaction. In some sections there was evidence of recent and old hemorrhage. This hemorrhage had occurred both into the cystic cavity and into the fibrous tissue. In the latter, well preserved red blood cells as well as macrophages laden with blood pigment were found. Some of the larger blood clots showed a peripheral margin of fibroblastic invasion as well as phagocytosis of red blood cells. In the areas of granulation tissue were elongated, endothelial-lined spaces with no definite supporting wall, some of which were filled with well preserved red blood cells. These vessels appeared to be larger and more numerous than usual.

The meningitis involving the leptomeninges was of a purulent type. The subarachnoidal spaces were filled with polymorphonuclear leukocytes and some fibrin. This exudate was diffuse and not limited to the perivascular space. The cortex of the brain was only slightly involved, chiefly following the course of the blood vessels. There was no evidence of repair. Nowhere in the leptomeninges was there evidence of hemorrhage. The lesions in the leptomeninges were more recent than the chronic subdural hematoma, which suggested that the *Bacillus coli meningitis* was a complication and not the etiologic factor. This was further supported by the clinical history.

ETIOLOGY

Trauma and infection have both been brought forward as etiologic agents in chronic subdural hematoma. After Virchow,[2] in 1857, stated that infection was responsible for the pathologic changes found in this condition, the infectious theory had many advocates. More recently trauma has been suggested as a cause and had been mentioned also previously to Virchow's paper. Many cases can be traced back to a traumatic origin, but there are also many that have no history of trauma.

Wiglesworth,[8] in 1892, raised objections against the infectious theory, mentioning the fact that chronic subdural hematoma was often

found in the insane; he suggested a degenerative process as a basis for the hemorrhage. Boudurant,[11] in 1893, agreed with this theory, and Ford Robertson,[14] in 1896, found degenerative changes in the dura in cases of chronic subdural hematoma. Robertson, as has been men-

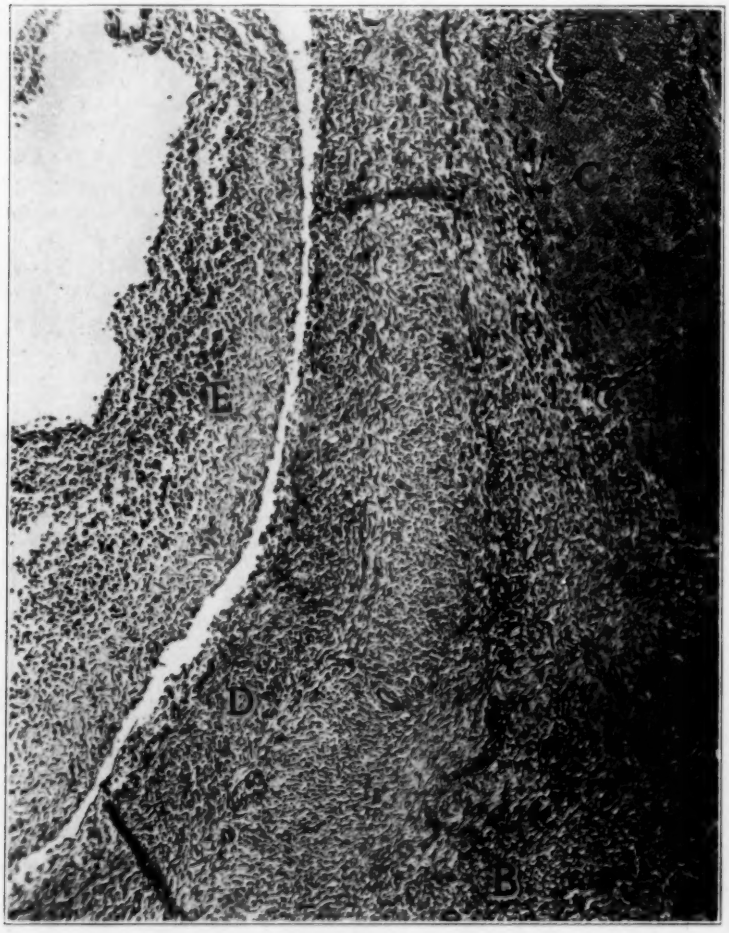

Fig. 3.—Section showing deep and attached layers of membrane and blood clot. *B* indicates inner or meningeal layer of dura; *C*, area of hemorrhage into fibrous tissue; *D*, attached portion of cyst membrane; and *E*, free portion of cyst membrane. (Dr. Ruben Z. Schulz.)

tioned, believed that degeneration of the dura accounted for some of the cases and rupture of the pial veins for others. Trotter,[33] in 1914, thought trauma was the important etiologic factor, but believed it might be aided by an underlying bleeding diathesis.

Trauma, it is true, seems to be directly responsible for many cases. Syphilis also accompanies chronic subdural hematoma often enough to cause one to suspect that it may be partially responsible for the bleeding in some cases, but it is not the sole etiologic factor. The other conditions that have been mentioned as possible causes are hemorrhagic disease of the new-born, scurvy, rickets, sepsis, pertussis, a long history of previous infection, trauma due to ventricular punctures and venous congestion from mitral stenosis or some other pathologic process.

In the cases reported in this paper none of the last mentioned factors seems to have played a part. Previous infection was present in some of the cases, but this observation was not constant enough to be of importance or even to make it appear markedly unusual. Two patients had had otitis media, one pneumonia and one tonsillitis. Sepsis, thought to be secondary, was present in one case. Hemorrhagic disease of the new-born, scurvy, pertussis, venous congestion or trauma of the cerebral veins due to previous treatment had not been experienced in any case. Rickets was present in case 7, as shown by roent-

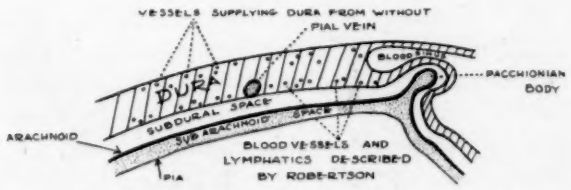

Fig. 4.—Schematic drawing showing dura, arachnoid and pia.

gen examination. In this case there was a long history of convulsions suggesting tetany. It is possible that hemorrhage may have occurred during one of these, causing a subdural hematoma.

No history of trauma could be elicited in any of the nine cases. In one case, the infant was delivered with instruments, and in another there was breech presentation. There apparently were no symptoms of cerebral hemorrhage after birth in these two cases. In case 9, however, the patient showed symptoms compatible with those from injury at birth, but there was no history of undue trauma. The only other suggestion of trauma was in case 5 in which an old fracture of the radius was found on roentgen examination. The history did not mention this point.

Five of the nine patients had rather dubious home conditions, being cared for by the state, by foster mothers or by charitable institutions. This fact made the histories less valuable and also brought up the question of possible trauma occurring with no admission of it being made, or perhaps unknown trauma occurring owing to lack of a mother's care.

This is a much higher percentage of infants who have not had a mother's care than is admitted to the hospital in the general run of cases.

Syphilis was present in case 6. In case 1, the patient had a negative Wassermann reaction of the blood and spinal fluid, but the mother had had syphilis previously. The mother had had rather unsatisfactory treatment, and the last Wassermann reaction, several years before the birth of the infant, had been positive. A syphilitic process in one case and suspicion of it in another in a small series of cases are suggestive of the fact that syphilis may play some rôle in causing this condition. It is known to cause bleeding in infancy in some cases, and trauma, however slight, combined with a bleeding diathesis such as this might be responsible for the lesion.

In case 6 also, the patient had a colon bacillus septicemia and meningitis. This infection may have increased the rate of bleeding, as there was a rapid enlargement of the head. Autopsy showed that the chronic subdural hematoma was older than the time from the onset of fever to death; so the infection cannot be given as a cause for the pathologic process found.

The etiology in infants remains obscure. In the usual case in infants there are probably not degenerative processes in progress such as Ford Robertson described in the insane. The fact that trauma is responsible for this condition in some cases in adults makes one suspicious that it may also be a factor in cases in infants. Trauma due to delivery or other causes, combined with a bleeding diathesis due to syphilis or infection might explain this condition in infants, but there is no proof that the disease occurs in this way in the cases reported. No one factor has been found to account for every case, and it seems more likely that the condition can occur as a result of more than one cause.

SYMPTOMS, PHYSICAL OBSERVATIONS AND LABORATORY DATA

Convulsions and enlargement of the head are the two most constant symptoms in infants. In only one of the cases reported were there no convulsions, and this was the only case that did not present some enlargement of the head by either observation or measurement. Vomiting and irritability are noted in about half of the cases. Fever had been or was present in five of the nine cases. In case 3 fever was present at the onset of the present illness with sore throat one week before the first convulsion occurred, but there was no fever during a two months' confinement in the hospital. The patient in case 4 showed fever on entry but his temperature fell to normal on the sixth day and did not recur during the two and a half months that the infant was in the hospital. The cause of this fever was not determined. In case 5, the patient was in the hospital for four weeks, during which time fever

occurred intermittently due to otitis media. In case 6 the patient had fever due to colon bacillus septicemia and meningitis. In case 7 the patient had fever due to recurrent attacks of bronchitis. In no case was the fever continuous with the course of the disease, and in only one case was the cause of the fever unknown. It seems that the occurrence of fever in these cases merely emphasizes the fact that intercurrent infections are likely to occur with chronic subdural hematoma and are due, in all probability, to a lowered resistance caused by the hematoma. In case 3, with an onset of fever one week before the first convulsion this may seem unlikely, but it is possible that the hematoma may have been present before the onset without causing symptoms at that time.

Cyanosis was noted in two cases, but one of these (case 9) showed this symptom for only two days after birth, and there was no recurrence during the course of the disease. Case 7 showed cyanosis only during convulsive attacks. There was a question of impaired sight in cases 4 and 5, but none of the patients were blind when last seen. Other symptoms that have been noted are: stupor, hypertonicity, nystagmus, cachexia and strabismus. A stuporous state was mentioned in cases 4 and 6. Hypertonicity was noted in case 4. Nystagmus was present in case 9. Wasting was marked in cases 4, 6 and 8. Strabismus on entry was not present, but occurred as a complication in case 4.

The most constant physical signs were those which accompany enlargement of the head, namely: a bulging fontanel and separation of the sutures. The former was found in four cases, and in two others the fontanel was tense; in three cases it was level. The sutures were spread in five cases, normal in three and not mentioned in one. Dilatation of the superficial veins of the scalp occurred in one case, and downward displacement of the eyes was noted in three cases. The former was not mentioned in four cases and was normal in four; the latter was absent in six cases.

Hemorrhages in the eyegrounds have been reported as occurring in about half the cases in infants, and this was found to be true in this series in which it occurred in four of seven cases, two patients not having been examined in this respect. The disks also showed changes in three cases varying from choking to atrophy, but the atrophy was not extensive enough to cause loss of vision.

Reflex changes are not uncommon. The knee reflexes were hyperactive in four of the nine cases, and the neck was stiff in two cases. The only other important physical change was an elevated blood pressure in two cases, one of which, however, was complicated by a colon bacillus septicemia. In four cases the blood pressure was not recorded.

The most important laboratory observations are those of the spinal fluid and the fluid obtained by subdural tap. The latter showed a bloody xanthochromic fluid in all cases, and this, of course, is pathognomonic

of the disease. The changes in the spinal fluid were interesting and apparently depended on the time during the course of the disease in which they were taken. It seems reasonable to believe that the spinal fluid may be clear or xanthochromic after the hemorrhage has become encysted, or that it may be bloody at the onset if the subarachnoid space is involved.

In five cases bloody spinal fluid was obtained. In two of the five, the fluid was xanthochromic after centrifugation; in the other three cases the fluid, unfortunately, was not tested for old blood, but in one case it was noted that the flow of blood was constant throughout the tap indicating a uniform bloody spinal fluid. In four of these cases the pressure was elevated.

In two cases clear fluid was obtained, in one case xanthochromic fluid without blood and in another case cloudy fluid due to infection. In three of the last four cases the pressure was elevated, making seven of nine cases in which the spinal fluid pressure was increased. Cultures from subdural taps and spinal fluids gave constantly negative results, except in case 6 in which the colon bacillus was present.

The Wassermann reaction for the blood was positive in one case and negative in eight cases. A Wassermann test on the spinal fluid was done in four cases and the reactions were all negative, including the case with the positive Wassermann reaction of the blood.

The bleeding time was increased from four and a half to eight minutes in four cases, in one of which there was septicemia. It was normal in four cases and not tested in one case. Clotting time was ascertained in seven cases and found to be increased only in the case with septicemia.

Roentgen examination was of little value in diagnosis except as confirmatory evidence. In two cases after air injection large patches of air were noted, presumably in the subarachnoid space. The only explanation for this seems to be that the subdural hematoma had distorted the subarachnoid space causing air to collect in pockets, or else the hematoma was in communication with the subarachnoid space. In one case (case 3) there was evidence to show that there might be some connection as the spinal fluid was bloody and xanthochromic, suggesting the air may have found its way into the hematoma. In the other case (case 5) the spinal fluid was clear, indicating that the hematoma was walled off so that the air must have remained in the subarachnoid space. Roentgenograms also showed separation of sutures and enlargement of the fontanel when these conditions were present.

DIAGNOSIS, COURSE, PROGNOSIS AND TREATMENT

Chronic subdural hematoma is suspected in an infant with enlargement of the head and convulsions. Hemorrhages in the eyegrounds,

if present, furnish additional evidence to help confirm the diagnosis. Finally, the diagnosis is confirmed by subdural tap. The differential diagnosis is concerned mostly with hydrocephalus due to infection, injury at birth, congenital abnormalities or tumor. Rickets associated with tetany and convulsions may present a picture somewhat resembling this condition.

The course is said to be from one to six months by Neff in his article in Abt's "Pediatrics." Rosenberg [42] mentioned two to five months as a probable course. In the cases reported, it is impossible to state definitely when the process no longer was progressive. In case 1, the patient was in the hospital four weeks and showed signs of abatement of the process when subdural tap was performed on discharge. The condition in case 2 was active with progressive enlargement of the head seven weeks after entry. In case 3 the process was active after one month in the hospital, as proved by subdural tap. This patient was in the hospital two months, during which time the head increased 2 inches in circumference; so the process was probably active on discharge, although no record of a subdural tap was made after the first month. The condition in case 4 was also probably active after two and a half months in the hospital, as the head increased 4⅝ inches in size. Relief in cases 3 and 4 was sought by lumbar puncture; so no data from subdural taps during the later weeks of confinement are available. In case 5, the condition was active after one month as indicated by subdural tap, but after two months the process had evidently become arrested. The patient in case 6 died about eighteen days after an acute onset with colon bacillus infection. In case 7 there was evidence of activity, as shown by subdural tap six months after first entry. The patients in cases 8 and 9 were in the hospital only a few days, the former being discharged with chickenpox to a contagious hospital and the latter because the parents requested it. In these cases, then, the condition showed activity after six months in case 7, and in cases 1 and 5 there was abatement of the process after one and two months, respectively. These results agree with the course of the disease suggested by Neff and Rosenberg.

Prognosis in chronic subdural hematoma in infants is good for life, but it is not unlikely that sequelae will follow. The danger of death from the disease is not great in itself, but the possibility of acquiring infections is ever present, and the infants who die often succumb to terminal infections. Sequelae related to the central nervous system were reported by Rosenberg [42] in ten cases.

In the nine cases reported in this paper, eight of the patients are living and one is dead. The patient in case 6 died with a colon bacillus septicemia and meningitis. In case 1, the patient was reported to be normal at the age of 1 year, seven months after entry. The patient in

case 2 still had an active process seven weeks after entry at the age of 13 months. The patient in case 3, nineteen months after entry, at the age of 2 years and 2 months, was normal except that he was underweight and tired easily. The patient in case 4, nearly four years after entry, at the age of 4 years and 9 months was confined in an institution for feebleminded children. The patient in case 5, six months after entry, at the age of 15 months, had strabismus and retarded development. The patient in case 7, thirteen months after entry, at the age of 2 years, was retarded in development. The patient in case 8, three years after entry, at the age of 3 years and 10 months, was apparently normal. In case 9, the patient, four and a half months after entry, at the age of 5 months, was reported to be doing well. Three of the nine patients are apparently normal children. One still has an active process; one is feebleminded; two show retarded development, and one of these has strabismus; one is dead; one is too young for a definite prognosis to be made, but is reported to be doing well. The results in these cases are somewhat better than those reported by Rosenberg,[42] but the ages of the children reported as normal range only from 1 year to 3 years and 10 months, and the period of observation from seven to thirty-six months, so that it is conceivable that some mental taint may become evident at a later date.

Treatment consists of relieving the pressure caused by the subdural hematoma by withdrawing the fluid by subdural taps. Lumbar puncture will relieve the pressure indirectly, but obviously cannot be used to drain the fluid from the hematoma because this is encysted and has no connection with the subarachnoid space in the latter stage of the disease, although it is probable that at the onset of the hemorrhage it may be involved. Operation, which has been successful in adults, is thought to be contraindicated in infants as long as the fluid can be withdrawn through the fontanel. After the active process has subsided, however, it would seem advisable to seek the advice of the neurosurgeons, as it is conceivable that the number of sequelae might be reduced if the membranes could be removed without too great an operative risk. Besides the local treatment, it is most important to build up the patient's general condition and to avoid contact with infection, as these patients are prone to acquire intercurrent disease which may be the cause of death. Injection of gelatin has not been tried in this clinic.

In making the diagnostic subdural tap, it is better to use a small hypodermic needle with a syringe attached rather than the usual lumbar puncture needle because of the danger of damaging a cerebral vein and causing hemorrhage which might later be the basis of symptoms referable to cerebral pathologic changes. To drain the fluid from the subdural space for therapeutic purposes, a lumbar puncture needle may be

used, as the brain is known to be displaced away from the dura by the hematoma once the diagnostic tap reveals a bloody xanthochromic fluid.

REPORT OF CASES

CASE 1.—*History.*—E. F., a girl, aged 4½ months, was admitted to the Infants' Hospital on Sept. 6, 1928, because of irritability and convulsions. The mother had had syphilis and had received treatment but not consistently. One other child was premature, and there were two stillbirths. The type of delivery was not ascertained. The infant had gained slowly, weighing 10 pounds and 2 ounces (4.5 Kg.) at the time of entrance. No history of trauma, whooping cough or hemorrhagic disease was elicited. There was no previous infection.

The infant was well until the afternoon of the day of entry, when she became irritable and screamed. Shortly after this a convulsion occurred, during which the patient was unconscious. This lasted about half an hour. The patient gradually recovered from the convulsion and began to cry normally, showing no other symptoms.

Examination.—The head measured 16 inches. The feet and legs were cold and blue. The anterior fontanel was open and showed no bulging. The eyegrounds showed many large hemorrhages. The blood pressure was 90 systolic and 50 diastolic. The results of examination were otherwise negative.

Laboratory Data.—The mother had a positive Wassermann reaction in 1922 and 1924 at the Massachusetts General Hospital. The father's Wassermann reaction was negative. The patient's blood and spinal fluid gave a negative Wassermann reaction. The spinal fluid gave a negative colloidal gold reaction. The urine showed white blood cells on one occasion; it was otherwise normal. The white blood cells numbered 12,000 with 72 per cent leukocytes. The red blood cells numbered 3,000,000. Bleeding time was three minutes; clotting time was four minutes. Nonprotein nitrogen was 39; blood calcium, 8.8; blood phosphorus, 5.7. Tuberculin test, 1:100, was negative.

Lumbar puncture on the day of admission showed bloody fluid throughout tap; on September 17, the fluid was clear, and there was increased pressure. Right subdural tap on September 17 showed bloody and xanthochromic fluid with 20 cc.; left subdural tap on the same day showed that the fluid was slightly bloody and xanthochromic with 1 cc. Fluid from the right ventricle was clear on September 17. Lumbar puncture on October 1 was clear, and pressure was normal. On October 1, fluid from the right ventricle was clear, and there was normal pressure. Right subdural tap on October 1 showed xanthochromic but not bloody fluid with 7 cc. Left subdural tap on the same day revealed a few drops of clear fluid. Cultures of these taps showed no organisms. No roentgen studies were made of the head.

Course.—The patient was in the hospital for four weeks, during which time the temperature was normal except on one occasion when it was 101 F. This occurred two days before an attack of diarrhea which lasted one week. She gained 12 ounces while in the hospital. No more convulsions occurred. The patient received mercury binder while in the hospital because of the mother's Wassermann reaction, although no other evidence of syphilis was found.

Seven months after discharge, no symptoms were noted, and the patient was apparently normal. Lumbar tap two weeks after discharge was reported bloody and xanthochromic. This was done at another hospital.

Comment.—There was no history of previous infection, trauma, whooping cough or hemorrhagic disease of the new-born. Syphilis in the mother and history of two stillbirths and premature sibling with no further evidence of disease in the infant or father cannot be said to be the etiologic factor with any assurance. The first lumbar puncture was bloody and, if not due to trauma, indicated that blood had found entry into the subarachnoid space. Subsequent lumbar punctures were clear which suggests that the hemorrhage was encysted and no longer in communication with the subarachnoid space, while subdural taps confirmed the diagnosis of subdural hematoma. The process appeared to be improving at the time of discharge, as the right subdural fluid was no longer bloody, and the left subdural space showed only a few drops of apparently clear fluid. This may possibly have come from subarachnoid space, as there is practically no fluid in the subdural space normally.

The fact that a lumbar puncture done outside the hospital was reported to have been bloody and xanthochromic indicates further activity at that time, which evidently quieted down later, as the child was apparently normal seven months after discharge.

CASE 2.—*History.*—C. R., a boy, aged 11 months, was admitted to the Infants' Hospital on April 4, 1929, because of loss of weight and vomiting for three weeks. The mother, unmarried, aged 23, was living and well. The father was living and well. There was no history of syphilis. The infant was boarded by a foster mother. The patient was born at full term; delivery was normal, with breech presentation. There was no history of trauma, syphilis, pertussis, hemorrhagic disease of the new-born or previous infection.

Three weeks before entry the patient suddenly had a convulsion. The following day vomiting occurred after every feeding. The type of vomiting was not known. Two and one-half weeks before entry the patient became restless, and the vomiting continued. One week before entry the head was noted to be enlarged. Emaciation had been progressive to date, and vomiting had persisted. No more convulsions had occurred.

Examination.—The patient was irritable and was poorly nourished. The head measured 18⅜ inches. The anterior fontanel was tense, but not bulging. The sutures of the skull were spread. The superficial veins of the scalp were engorged. The eyes were downwardly displaced. Examination of the eyegrounds showed: right disk slightly blurred about the margin and the left disk normal. Veins of the right eye were congested; those of the left were normal. There were no hemorrhages. Rosary and Harrison's groove were present. The abdomen was protuberant. The Babinski sign on the right was suggestive. The blood pressure was systolic 90. Results of examination were otherwise essentially negative.

Laboratory Data.—The white blood cells numbered 17,000 at the time of entrance. Four days later they numbered 8,000 with 65 per cent polymorphonuclears. The urine was normal. The Wassermann reactions on the blood and spinal fluid were negative. The mother's Wassermann reaction was also negative. Tuberculin test, 1:100, was negative. Bleeding time was six minutes and clotting time four and one-half minutes.

On the day of entrance lumbar puncture showed: increased pressure; xanthochromic fluid; globulin positive; sugar normal and many red blood cells with rare crenated red blood cells. Culture showed no growth. On April 6, lumbar puncture showed: pressure 300; slightly cloudy fluid with few red blood cells and 1 white blood cell; 8 cc. was withdrawn. Right subdural tap showed pressure and bloody, xanthochromic fluid; 20 cc. was withdrawn. Left subdural tap showed pressure and bloody, xanthochromic fluid; 13 cc. was withdrawn. Fluid from the right ventricle was bloody and xanthochromic. Pressure was normal. Seven cubic centimeters was withdrawn. Fluid from the left ventricle was slightly bloody and xanthochromic. Pressure was normal. Five cubic centimeters was withdrawn.

Fluid continued to be present over the cerebral hemispheres and was tapped occasionally for relief from pressure. The lumbar fluid finally became clear. Bile was present in one test of fluid found over the cerebrum.

No organisms were grown from the fluid over the cerebrum or from that obtained by lumbar puncture.

Roentgen examination was essentially negative except for evidence of pressure within the skull.

Course.—The patient was in the hospital three weeks. He gained weight. The head did not decrease in size. The temperature was normal. Pressure was relieved by tapping the subdural space from time to time. Vomiting occurred only occasionally.

The patent was seen one month later. The head measured 19⅜ inches, which was about 1 inch larger than previously. Bilateral subdural tap was done, and 70 cc. of slightly bloody, xanthochromic fluid was removed.

Comment.—This patient had a layer of bloody xanthochromic fluid about 1 inch in thickness over the cerebrum bilaterally and also a similar fluid in the left ventricle. The lumbar fluid was xanthochromic at the first tap and showed red blood cells which observation would be consistent with hemorrhage in the left ventricle or hemorrhage over the cerebrum with involvement of the subarachnoid space. The fact that later lumbar punctures showed clear fluid indicated that the ventricular hemorrhage had ceased and that the hemorrhage over the cerebrum had become walled off. The process was active on discharge and continued to be active one month later, when the patient was seen in the outpatient department.

CASE 3.—*History.*—C. E., a boy, aged 7 months, was admitted to the Infants' Hospital on Sept. 2, 1927, because of enlarged head and convulsions. The family history was essentially negative. There was no history of syphilis. The patient had never been robust and was described by the mother as "sick and colicky." There was no history of any definite illness previously, however. Delivery was instrumental at full term. There was no other history of possible trauma, whooping cough, hemorrhagic disease or syphilis.

Four weeks before entry the patient had fever and sore throat. Three weeks before entry a convulsion which lasted ten minutes occurred. Three days before entry a second convulsion occurred which lasted one minute. The head has gradually become larger during the present illness.

Examination.—The head measured 18 inches. The anterior fontanel was open and bulging. Sutures were spread. The eyegrounds showed marked hemorrhages and choked disks with beginning atrophy. The knee reflexes were hyperactive. The neck was stiff. Slight rosary was present. The blood pressure was not recorded.

Laboratory Data.—The urine was normal. The white blood cells numbered 13,400 with 50 per cent leukocytes. The red blood cells numbered 5,020,000. Bleeding and clotting times were normal. The Wassermann reaction of the spinal fluid was negative; that of the blood was also negative. Lumbar puncture on the day of admission showed bloody xanthochromic fluid; pressure was increased. Subdural tap showed bloody xanthochromic fluid. Lumbar puncture on September 6 revealed slightly bloody, moderately xanthochromic fluid; pressure was increased; on September 10, the fluid was slightly bloody and moderately xanthochromic. Subdural tap on the same day showed bloody, xanthochromic fluid (flow continued as needle was inserted 1¼ inches). Lumbar puncture on September 16 revealed slightly xanthochromic fluid; pressure was increased; on October 21, the fluid was clear and pressure was increased; the slightest possible trace of globulin was present, and on October 29 the fluid was clear and pressure was again increased, and there was only a slight trace of globulin. No organisms were found on culture of the spinal and subdural fluids. No increase in the white blood cells was found in the spinal fluid as the hemorrhage cleared up. Ventriculograms showed air scattered irregularly in considerable amounts in the subarachnoid space. The largest single accumulation appeared to be in the subtentorial region. The ventricles were apparently not filled. Roentgenograms of the skull showed sutures slightly separated.

Course.—The temperature remained normal while the patient was in the hospital (two months), and the patient gained 1 pound (0.5 Kg.) during this time. The head increased in size from 18 inches at the time of admission to 19 15/16 inches on discharge. Repeated lumbar taps were done to relieve the condition, but without evident success.

Nineteen months after entry, at the age of 2⅙ years, the infant appeared to be normal. He had sixteen teeth and, evidently, his development was not retarded. He walked and talked, but tired rather easily.

Comment.—In this case blood was found in the spinal fluid for one week after the first lumbar puncture. It then became xanthochromic and finally became clear, but always under increased pressure. The changes in the spinal fluid probably represent the gradual encystation of the hematoma. The head gradually became larger during the time the patient was in the hospital. Repeated lumbar punctures failed to relieve the condition. Subdural taps, it seems, should have been done frequently in this case to relieve the pressure.

CASE 4.—*History.*—R. M., a boy, aged 7 months, was admitted to the Infants' Hospital on March 24, 1925, because of convulsions. The family history was negative; there was no history of syphilis. Delivery had been normal. There was no history of whooping cough, hemorrhagic disease of the new-born, trauma or syphilis. The previous illness included conjunctivitis, otitis media and rickets. The patient was cared for in a charitable institution, and little information could be obtained in regard to the present illness. He evidently had convulsions the morning of the day of admission and was sent to the hospital at once.

Examination.—The head measured 18⅜ inches in circumference. The patient was semicomatose and spastic. The eyes were staring. The eyegrounds showed hemorrhages. The disks showed no choking. The fontanel was open but was not bulging. The neck was slightly stiff. The reflexes were exaggerated. The blood pressure was not recorded.

Laboratory Data.—The urine was normal. The white blood cells numbered 20,800, with 78 per cent leukocytes. The red blood cells numbered 3,100,000. The blood calcium was 7.4; the blood phosphorus was 3.4. Blood culture gave negative results. The bleeding time was eight minutes; the clotting time was not determined. Lumbar puncture on March 25, 1925, was bloody. Bilateral subdural tap on March 31 revealed bloody xanthochromic fluid. There was bloody fluid just under the dura and xanthochromic fluid under this. Lumbar puncture on April 2 showed straw-colored fluid; pressure was slightly increased. On April 4, lumbar puncture revealed straw-colored fluid; pressure was slightly increased. Lumbar punctures on eight subsequent taps showed clear fluid but with increased pressure. Then for four taps the fluid was slightly xanthochromic, but cleared up before the patient's discharge. The last two lumbar punctures showed normal pressure. When the spinal fluid was xanthochromic, an increase in the red and white blood cells was noted. Cultures were negative. The subdural space was tapped only once. No roentgen studies were made. The Wassermann reaction of the blood was negative.

Course.—The patient was in the hospital for about two and one-half months, during which time he had no more convulsions. He had an infection on entry as the temperature rose from 100 at the time of admission to 104 F. shortly after and then fell to normal on the sixth day. The white blood cell count was also consistent with the temperature. The nature of this infection was not ascertained. The temperature then remained normal during the remainder of the patient's stay in the hospital. The size of the head increased from 18⅜ to 23 inches at the time of discharge. He gained 4 pounds (1.8 Kg.). There was some question in regard to impaired vision. Repeated lumbar taps failed to influence the course of the disease.

The patient was sent to the Nursery for Blind Babies. He was readmitted to the hospital on Jan. 16, 1926, at the age of 17 months with pneumonia. Old hemorrhages were noted in the eyegrounds, and the disks were pale. Hydrocephalus appeared to be arrested. He weighed 23½ pounds (10.6 Kg.). He recovered from pneumonia and was discharged.

Nearly four years after discharge, at the age of 4 years and 9 months, this child was living in an institution for feebleminded children. Physical examination gave negative results, except for internal strabismus of the left eye and an inferior mental state.

Comment.—The first lumbar puncture was not tested for old blood, but probably indicated that the subarachnoid space was involved, as it was followed two weeks later by others which showed xanthochromic fluid and increased pressure. The head continued to increase in size, indicating oozing into the hemorrhage found subdurally. Unfortunately subdural taps were not repeated. An interesting observation was the fact that bloody fluid was found just under the dura, and, as the needle was inserted farther, the fluid became xanthochromic. The bleeding time of eight minutes was not checked and remains as a solitary obser-

vation. No bleeding elsewhere was noted. The white blood cells in the spinal fluid were probably not due to infection as indicated by the course of the disease and absence of temperature and negative cultures. The blood phosphorus might indicate mild rickets at the time of admission. In this case, as in case 3, lumbar punctures were of no avail in checking the disease.

CASE 5.—*History.*—E. B., a girl, aged 9 months, was admitted to the Infants' Hospital on Oct. 25, 1928, because of recurrent convulsions of two months' duration and enlargement of the head.

The history was practically negligible as the infant was cared for as a state ward and the father knew little about the course of illness. As far as could be ascertained, the infant was delivered at full term. Delivery was normal. Development was normal. There were no previous illnesses. There was no history of trauma. The patient had not had whooping cough or hemorraghic disease of the new-born. There was no family history of syphilis.

Two months before admission the patient had convulsions the nature of which were not known. These continued until the date of admission, but the frequency was not known. About one month before admission, it was noted that the head was enlarged. No other symptoms were observed.

Examination.—The head measured 17¼ inches in circumference. The blood pressure was 80 systolic and 60 diastolic. The fontanel was tense, and the sutures were spread. The eyegrounds showed hemorrhages and atrophy of the disks. There were needle puncture wounds on the scalp and in the lumbar region where previous ventricle and lumbar punctures had been attempted. Results of physical examination were otherwise negative.

Laboratory Data.—The urine was normal. The white blood cells numbered 12,800, with 80 per cent leukocytes. The red blood cells numbered 5,250,000. The Wassermann reaction of the blood was negative. Tuberculin test, 1:100, was negative. The bleeding time was two and one-half minutes; the clotting time four minutes. On October 27, lumbar puncture showed the spinal fluid to be normal except for increased pressure. On the same day, the right subdural tap showed bloody, xanthochromic fluid; left subdural tap showed bloody, xanthochromic fluid also. On November 4, lumbar puncture showed negative spinal fluid and no increase in pressure. On November 7, subdural taps showed bloody, xanthochromic fluid. Subdural taps done November 13 showed bloody, xanthochromic fluid. On the same day lumbar puncture revealed xanthochromic fluid and an increase in pressure. Cultures of spinal and subdural fluids showed no organisms except one contamination. Ventriculograms showed well filled ventricles which were not displaced or enlarged. There was a large amount of air in the subarachnoid space. The brain appeared much smaller than the cranial vault. An old fracture of the right radius also was discovered surrounded by callus formation.

Course.—The patient was in the hospital four weeks, during which time she developed otitis media, which caused a rise in temperature on several occasions. The urine showed white blood cells on two occasions before discharge, but was normal on repeated tests. The size of the head did not increase or diminish. She had no convulsions. The optic atrophy was not severe enough to prevent her seeing objects. The weight at the time of admission was 13 pounds and 8 ounces (5.11 Kg.), and on discharge 13 pounds and 6 ounces (5.10 Kg.).

Six months after entry at the age of 15 months the patient showed retarded development and strabismus. She had had no symptoms since discharge, and the process did not appear to be active.

Comment.—The fractured radius suggested previous trauma, which could not be elicited in the history. The first two lumbar punctures giving negative results (except for increased pressure) suggest that hemorrhage was confined to the subdural space and was not invading the subarachnoid space. The lumbar puncture done on November 13 showing xanthochromic fluid suggests that previous subdural taps may have opened up the subarachnoid space. The only suggestion in regard to etiology was the possibility of injury to the head received, perhaps, when the radius was fractured. The leukocytosis on the patient's entry has not been satisfactorily explained except as percursor of the rise in temperature which developed three days later and which was caused by otitis media. Although the head appeared large, it measured only 17¼ inches, which was only a slight enlargement for an infant of this age. The optic atrophy was thought by the consulting oculist to be the result of previous choked disks.

CASE 6.—*History.*—A. A., a boy, aged 10 months, was admitted to the Infants' Hospital on Dec. 21, 1928, because of enlarged head and fever. The mother said that she did not have syphilis but that the patient had the disease. There had been one miscarriage. The infant was boarded by a foster mother. Delivery had been normal. There was no history of trauma, whooping cough or hemorrhagic disease of the new-born. The patient had snuffles and blotchy, macular rash at the age of 3 months. The Wassermann reaction was positive. The infant had received one treatment of sulpharsphenamine. The mother stated that the child's health had not been good, but mentioned no other specific previous illness.

Five months before the patient's admission vomiting occurred at various intervals, usually once or twice a week. Three months before entry vomiting became definitely projectile in type and occurred as frequently. The patient had no other symptoms until two weeks before admission when it was noted that the head was large. At this time the infant became irritable. No new developments were noted until three days before entry when the patient refused food, developed sore mouth, became pale and had a fever. Since then symptoms continued to be present, and the patient cried out shrilly even when let alone. One day before admission there was twitching of the left leg. The eyes became sunken, and great loss of weight was said to have occurred.

Examination.—The patient was markedly pale and was in a comatose state. The head was noticeably large, measuring 20⅜ inches in circumference. The anterior fontanel was bulging and the sutures were spread. The eyes were slightly displaced downward; the eyegrounds showed no remarkable observations. General lymphoid adenopathy was present. Coarse tracheal râles were present throughout the chest. The liver was palpable. The knee reflexes were hyperactive. Clubbing of the toes was noted. The blood pressure was 135 systolic and 80 diastolic.

Laboratory Data.—The urine was normal. The white blood cells numbered 5,400, with 60 per cent polymorphonuclears. The red blood cells numbered 3,330,000. The Wassermann reaction of the blood was positive; that of the spinal fluid was negative; the colloidal gold curve was 3454321000. The tuberculin test, 1:100, was negative at the time of death (after twenty-four hours). Sedimentation time was five minutes; bleeding time six minutes, and clotting time

seven minutes. Blood culture showed colon bacillus. Lumbar puncture on December 21 showed increased pressure and cloudy fluid; sugar was not present. Globulin was positive. There were 65 cells, 38 per cent polymorphonuclears and 62 per cent lymphocytes. Culture showed *B. coli*. The smear was loaded with colon bacilli. Bilateral subdural taps showed increased pressure and bloody, xanthochromic fluid beneath the dura. In the left subdural space, bloody fluid was obtained when the needle was just below the dura, but, on inserting farther, a xanthochromic fluid was obtained. Roentgen examination showed a thin cranial vault with separation of sutures. Ventriculograms were not made.

Course.—The child died after being in the hospital for forty-eight hours. Consciousness was never regained after entry, and toward the end generalized convulsions were present almost constantly. The temperature rose rapidly and was 105 F. at the time of death. The autopsy has been reported in the foregoing paragraphs.

Comment.—This is the only case in which syphilis was proved to be present. That the subdural hematoma was present before onset of infection, there is no doubt, as proved at autopsy. The spinal fluid was cloudy because of the infection and showed no evidence that subdural hematoma had any connection with the subarachnoid space. The subdural taps proved conclusively the presence of a bilateral subdural hematoma. The interesting observation noted before in case 4 was repeated in this case, namely, the presence of blood just under the dura and a clear xanthochromic fluid beneath the blood. There evidently was an exacerbation of the process to account for the acute enlargement of the head during a period of two weeks, if the history is correct in respect to this fact. Bleeding, clotting and sedimentation tests were all compatible with sepsis. The white blood cell count showed poor reaction to infection. The colon bacillus infection evidently occurred with the rise of temperature three days before the patient's admission. The subdural hematoma had been present for some time and evidently bleeding increased without known cause two weeks before entry at which time the head was noted to be enlarged. The septicemia evidently caused bleeding to take place even more easily than before it occurred.

CASE 7.—*History.*—J. S., a boy, aged 11 months, was admitted to the Infants' Hospital on March 26, 1928, because of convulsions. The family history was negative. There was no history of syphilis. The mother was dead. The patient was cared for by a foster mother. Delivery was normal. There was no history of trauma. Otitis media occurred at the age of 5 months. Since this time to date the child had been subject to convulsions which usually lasted about five minutes and occurred with varying frequency from once a week to as many as ten in one day. There was no history of syphilis, whooping cough or hemorrhagic disease of the new-born. The patient was brought to the hospital because of the convulsions already mentioned. During these he turned blue, perspired freely, became semicomatose and shook severely. After an attack he would sleep for several hours. Rise in temperature was said to occur with attacks, being as high as 103 F.

Examination.—Results of examination were essentially negative except for infected throat and a slight rosary. The blood pressure was 145 systolic and 75 diastolic. The head measured 18⅝ inches. The anterior fontanel was open but was not bulging. The eyegrounds showed some pallor of the disks, but no hemorrhages.

Laboratory Data.—At the time of first admission, the urine showed white blood cells on rare occasions. The white blood cells numbered 19,000, with 34 per cent leukocytes. The Wassermann reaction was negative. Tuberculin test, 1:100, was negative. The blood calcium was 11.1. The nonprotein nitrogen was 40. Bleeding time and clotting time were normal. Blood cultures were negative. Renal function was 50 per cent. Lumbar puncture revealed clear fluid; no positive observations were noted. At the time of second entry, May 5, 1928, left subdural tap revealed xanthochromic fluid; pressure was 170 mm. Right subdural tap showed clear fluid; the pressure was 90 mm. On May 22, left subdural tap showed xanthochromic fluid and increased pressure; 30 cc. was withdrawn. On the same day, right subdural tap showed a few drops of clear fluid, possibly from the subarachnoid space.

On October 1, following the patient's third admission, bilateral ventricle taps revealed clear fluid; on October 1, right subdural tap showed bloody xanthochromic fluid and left subdural tap also showed xanthochromic fluid. On October 5, lumbar puncture revealed slightly xanthochromic fluid. Cultures taken on only one occasion gave negative results. White blood cells were not present in lumbar or ventricle taps. Roentgen examination showed rickets and the anterior fontanel to be larger than normal for the patient's age.

Course.—The patient was brought to the hospital twice after the first entry with complaint of convulsions. During the patient's first admission, the abnormal observation of increased blood pressure was not explained. It remained elevated until the time of discharge. The temperature was not elevated during the patient's first admission. The head was slightly enlarged, and neurosurgeons thought that the fundi were slightly pale.

During the patient's second admission, on May 5, 1928, subdural taps established the diagnosis. The patient was discharged, but was not brought back to the outpatient department.

Finally, on Sept. 22, 1928, the patient was again brought to the hospital with convulsions. Subdural taps again proved that the process had not subsided. The temperature was elevated on two occasions during the last two entries, when infection of the upper respiratory tract was apparent. Only one convulsion occurred in the hospital, and this was during the first entry. It was not severe, but was accompanied by a temperature of 102.8 F. The blood pressure averaged 120 systolic and 90 diastolic during the last two admissions. The head increased from 18⅝ inches on admission in March, 1928, to 19⅜ inches in October, 1928.

At the age of 2 years, thirteen months after the first entry, the child showed retarded development but had had no convulsions for several months.

Comment.—The first spinal puncture gave negative results, but the subdural hematoma was probably present at this time. Later (on second entry) subdural taps established the diagnosis. The final lumbar puncture showed xanthochromic fluid, but this may have been due to opening of the subarachnoid space by subdural puncture or possibly to the fact that hemorrhage had found entry to the subarachnoid space by some other means.

The fact that otitis media was followed by convulsions and that elevation in temperature was said to occur with attacks may incline one to think of an infectious basis, but this has not been proved. Tetany could also be responsible for long continued convulsions.

The clear fluid obtained from the right subdural space was an unusual observation and may have come from the subarachnoid space. Later this side showed xanthochromic bloody fluid, indicating that the process had been active in that region since the previous tap. If enlargement of the head and convulsions had been thought of as indicating the presence of a chronic subdural hematoma, the condition in this case would have been diagnosed at the time of first admission.

CASE 8.—*History.*—C. G., a girl, aged 10 months, was admitted to the Infants' Hospital on April 18, 1926, because of vomiting and loss of weight. The family history was negative. There was no history of syphilis. Delivery was normal. There was no history of trauma, whooping cough or hemorrhagic disease of the new-born. Six weeks before entry the patient had pneumonia. Five weeks before entry she had recovered from pneumonia, but the cough persisted. From this time to date, cough had been present and loss of weight had occurred. Ten days before entry, vomiting occurred and had persisted to date at least twice each day. (Type was not mentioned.) In six weeks the patient had lost from 19 pounds and 5 ounces to 13 pounds and 11 ounces (8.9 to 6.2. Kg.). No convulsions or neurologic signs were present.

Examination.—The patient was poorly nourished and irritable. The circumference of the head was 17½ inches. The anterior fontanel was slightly bulging. The eyegrounds were not examined. There was slight lymphoid adenopathy. The blood pressure was not recorded. The results of the examination were otherwise negative.

Laboratory Data.—The urine showed a few white blood cells. The white blood cells numbered 13,600, with 69 per cent polymorphonuclears. The red blood cells numbered 4,980,000. The Wassermann reaction was negative. Tuberculin test was negative.

Lumbar puncture on April 19 showed bloody fluid; pressure was normal. On April 21, right ventrical tap showed: clear fluid, 8 cells, no increased pressure and no globulin. Right subdural tap revealed bloody, xanthochromic fluid; 20 cc. was removed. Cultures of the spinal fluid were taken, but the results were not recorded. The bleeding and clotting times were not recorded. No x-ray studies were made.

Course.—The patient developed chickenpox and was sent to a hospital for contagious diseases. Unfortunately she was not brought back to the Infants' Hospital. At the age of 3 years and 10 months, three years after admission, the child was apparently normal.

Comment.—A report of this case is included merely because it is without doubt one of chronic subdural hematoma. The data, however, are incomplete. The bloody lumbar puncture may have been due to trauma. The subsequent ventricular tap gave negative results, which evidence bears out this statement. The subdural tap is proof of the presence of chronic subdural hematoma.

Summary of Observations in Nine Cases

Symptoms

Case	Convulsions	Enlarged Head	Vomiting	Irritability	Fever	Cyanosis	Blind	Coma	Cachexia
1	Yes	Very slight	No	Yes	No	No	No	No	No
2	Yes	Yes	Yes	Yes	No	No	No	No	No
3	Yes	Yes	No	No	Yes (onset)	No	No	No	No
4	Yes	Yes	Not mentioned	Not mentioned	Yes	No	? impaired sight	Yes	Yes
5	Yes	Slight	No	Not mentioned	Occasionally in hospital	No	? impaired sight	No	No
6	Slight	Yes	Yes	Yes	Yes	No	No	Yes	Yes
7	Yes	Yes	No	No	Yes	Yes	No	No	No
8	No	No	Yes	No	No	No	No	No	Yes
9	Yes	Yes	Yes	No	No	Yes (for 2 days after birth)	No	No	No

Physical Changes

Case	Fontanel	Sutures	Superficial Veins of Scalp	Downward Displacement of Eyes	Hemorrhage of Eyegrounds	Knee Jerks	Neck	Elevated Blood Pressure
1	No bulging	Normal	Normal	No	Yes	Normal	Not stiff	No
2	Tense	Spread	Prominent	Yes	No	Normal	Not stiff	No
3	Bulging	Spread	Not mentioned	No	Yes (disks early atrophy and choking)	Hyperactive	Stiff	Not recorded
4	No bulging	Not mentioned	Not mentioned	No	Yes	Hyperactive	Stiff	Not recorded
5	Tense	Spread	Normal	No	Yes (disks atrophy)	Normal	Not stiff	No
6	Bulging	Spread	Normal	Yes	No	Hyperactive	Not stiff	135/80
7	No bulging	Normal	Normal	No	No (disks pale)	Normal	Not stiff	145/75
8	Slight bulging	Normal	Not mentioned	No	Not examined	Normal	Not stiff	Not recorded
9	Bulging	Spread	Not mentioned	Yes	Not examined	Hyperactive	Not stiff	Not recorded

Laboratory Data

Case	Wassermann: Blood	Wassermann: Spinal Fluid	Lumbar Puncture on Entry	Subdural Tap	Culture, Spinal and Subdural Fluids	Bleeding Time	Clotting Time	TBC	Roentgen Examination
1	Mother + 4 years ago infant neg.	Negative	Pressure + bloody	Pressure + bloody xanthochromic	Negative	Normal	Normal	Negative	Not done
2	Negative	Negative	Pressure + xanthochromic	Pressure + bloody xanthochromic	Negative	6 min.	Normal	Negative	Hydrocephalus
3	Negative	Negative	Pressure + bloody xanthochromic	Pressure + bloody xanthochromic	Negative	Normal	Normal	Negative	Hydrocephalus
4	Negative	Not done	Pressure slight + bloody	Pressure + bloody xanthochromic	Negative	8 min.	Not done	Negative	Not done
5	Negative	Not done	Pressure + clear	Pressure + bloody xanthochromic	Negative	Normal	Normal	Negative	Hydrocephalus
6	Positive	Negative	Pressure + cloudy	Pressure + bloody xanthochromic	B. coli	6 min.	7 min.	Negative (24 hrs.)	Hydrocephalus
7	Negative	Not done	Normal	Pressure + bloody xanthochromic	Negative	Normal	Normal	Negative	Large fontanel
8	Negative	Not done	Pressure normal, bloody	Pressure + bloody xanthochromic	Not recorded	Not done	Not done	Negative	Not done
9	Negative	Not done	Pressure + bloody xanthochromic	Pressure + bloody xanthochromic	Not recorded	4½ min.	Normal	Not recorded	Not done

CASE 9.—*History.*—N. R., a girl, was seen in the private ward, Dec. 22, 1928. The history was somewhat incomplete, as the patient was not admitted to the public ward and so was not submitted to the usual routine. She was born at full term, but no mention was made concerning the type of delivery. There was no definite statement in regard to trauma, syphilis, hemorrhagic disease or previous infection.

The present illness began with cyanotic attacks at birth. At that time a systolic murmur was heard, and it was thought that the baby might have a congenital condition of the heart. Cyanotic attacks did not recur after the first two days of life, and the infant did well for three weeks except that she seemed less vigorous than normally and did not cry.

At 3 weeks of age, the patient vomited; the cause was not ascertained. Two days later, the head was noted to be larger than previously, the fontanel was bulging, and the sutures were spread. Generalized convulsions occurred, and the eyes were displaced downward.

Examination.—At the time of the patient's admission, the sutures were separated, the fontanel was bulging, and there were typical facies of hydrocephalus. Nystagmus was present and the reflexes were active. Systolic murmur was present. Convulsive twitchings were noted and the patient was stuporous.

Laboratory Data.—The urine was normal. The hemoglobin content was 55 per cent. The red blood cells numbered 2,870,000; the white blood cells, 11,000. The differential count was not unusual. The platelets numbered 700,000. The clotting time was four and one-half minutes; the bleeding time four and one-half minutes. Lumbar puncture revealed bloody xanthochromic fluid; the pressure was 250. Subdural tap showed bloody xanthochromic fluid and increased pressure. Distance of skin to cortex was 2 cm. The fluid obtained on tap of the ventricle was slightly blood-tinged; this was probably due to blood in the needle from the subdural tap. The pressure was decreased. The blood pressure was not taken. The Wassermann reaction of the blood was negative. Culture of the lumbar fluid gave negative results. No x-ray picture of the skull was taken.

Course.—The patient was in the hospital only two days. The first day a convulsion occurred. The second day there was slight twitching. The temperature was between 99 and 100 F. At the request of the family the patient was discharged on the second day after admission. Four and one-half months after entry, at the age of 5 months, this infant was apparently doing well with no further signs of increased intracranial pressure.

Comment.—This case is most interesting because the patient had symptoms compatible with intracranial hemorrhage at birth. The onset of vomiting at the age of 3 weeks is compatible with this diagnosis. If this is so, the developing of a chronic subdural hematoma from injury at birth is of great interest with respect to the etiology of this condition.

COMMENTS AND CONCLUSIONS

The nine cases described present a definite clinical syndrome. The pathologic changes in the disease called pachymeningitis interna hemorrhagica may vary considerably, due to the fact that in the past many conditions involving the dura have been described as pachymeningitis. Chronic subdural hematoma describes the condition found in the nine cases reported.

The etiology is obscure. It was unusual to find that in five of the nine cases described the patients were cared for in institutions or by foster mothers. Trauma due to injury at birth or other means is a possible factor, although not proved in the series of cases reported. Infection is important only as a complication. Syphilis may play a part in some cases, or a bleeding diathesis may play a rôle, but this also could not be proved in the nine cases reported.

The diagnosis should be thought of in every case in which there are convulsions and enlargement of the head and should be confirmed by subdural tap. The diagnostic subdural tap should be done with a hypodermic needle with a small syringe attached to avoid trauma to cerebral veins in case no chronic subdural hematoma is present. After the diagnosis is established, a small lumbar puncture needle can be used to drain the cyst. Strict asepsis should be assured, as the hematoma is easily infected. After the active process has subsided the patient should have the benefit of a neurosurgical consultation.

The prognosis is good if the cyst is drained and if no intercurrent infection occurs. Everything should be done to raise the patient's general resistance in order to prevent the danger of an intercurrent infection. Sequelae occur in a high percentage of cases.

Case Reports

THE EFFECT OF PILOCARPINE IN A CASE OF SYMPATHICOTONIA IN CHILDHOOD*

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AND
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The term sympathicotonia has been used by Danielopolu [1] in his classification of the functional abnormalities of the vegetative nervous system to designate a hyperactivity of the sympathetic innervation as compared with that of the parasympathetic. The subject has been completely reviewed by Guillaume,[2] who mentioned the lack of information concerning this condition in children and suggested the possibility that it occurs far more frequently than is supposed at present.

This paper consists of the case history of a child presenting bizarre paroxysms of abdominal pain, associated with collateral observations which coincide with the clinical picture of sympthaticotonia as described previously for adults. Therapy based on the assumption that an imbalance existed between the two divisions of the autonomic nervous system was singularly successful in relieving symptoms that had existed for years, and that had previously resisted both medical and surgical treatment.

REPORT OF CASE

History.—D. G., a white girl, aged 10, was admitted to the Children's Ward, University Hospital, in November, 1927, with a chief complaint of intermittent attacks of abdominal pain beginning at the age of 9 months. The attacks usually occurred every two or three weeks but the frequency of the seizures varied widely at times. Occasionally they were present daily over a period of one or two weeks, and once the free interval lasted for almost eleven months, the latter at the age of 7. Between attacks the patient seemed perfectly well.

Each attack consisted of a short period of generalized abdominal discomfort, followed by excruciating epigastric pain, during which the child moaned, rubbed her epigastrium violently, begged for water, and went through violent contortions

* Submitted for publication, Sept. 23, 1929.
* Read by title before the American Pediatric Society, St. Louis, May 1929.
* From the Department of Pediatrics, School of Medicine, University of Pennsylvania.

1. Danielopolu, D.: Méthodes d'examen du system nerveux végétatif chez l'homme, Bull. méd. **37**:983, 1923.

2. Guillaume, A. C.: Vagotonies, sympathicotonies, neurotonies, Paris, 1928.

and writhings. The pain usually lasted from two to ten minutes, then gradually became less severe, and finally disappeared. The remissions lasted from four to ten minutes, but the paroxysmal pain returned again repeatedly over a period of from two to four hours, after which the child was pale, exhausted and sleepy. Within an hour after the last paroxysm she seemed to be perfectly well and normally active.

The pain was always accompanied by profuse perspiration, constipation and frequently by vomiting, which afforded no relief. The vomitus consisted of large amounts of undigested food, lacking the acid odor characteristic of the normal contents of the stomach. Sedatives (except morphine), enemas and the withholding or the taking of food provided no relief.

The family and the social history were essentially unimportant. The patient was born at full term, but weighed only 4 pounds (1.8 Kg.), though she gained rapidly on breast feeding. She was weaned at 9 months, owing to the onset of these attacks. The physical and mental development in early years seemed normal. An appendectomy was performed when the patient was 3 years of age, but without relief from the symptoms.

Physical Examination.—On admission to the hospital, physical examination showed underdevelopment; the height was 12 inches (30.48 cm.) below the normal for the patient's age, and the weight 45 per cent below standard. Her weight for height was only 5 per cent below the average, being that of a 6 year old child. She had been admitted at the end of a severe attack. At this time the only signs remaining were hyperactive tendon reflexes, and slight tenderness in the epigastrium. The blood pressure was 109 systolic, 44 diastolic. Otherwise, the results of the physical examination were essentially negative. The patient appeared to be perfectly normal; she played actively, ate well and gained weight slowly but consistently.

The Attack.—On careful observation the patient showed diminished activity for several hours preceding the prodromal symptoms. She complained first of vague abdominal discomfort and, recognizing the onset of an attack, went to bed of her own accord. Shortly afterward, she began to rub her abdomen with her clenched fist, and shrieked with pain. Her face was flushed, with a ring of pallor about the mouth. The pupils dilated with the onset of pain, and diminished in size with the remission. The oral mucous membranes were dry and the face and body were covered with perspiration. She begged constantly for water, and her attempts to moisten her lips resembled the so-called "sucking movements" described in sympathicotonia of adults. Respiration was modified by a series of expiratory grunts with frequent yawning.

During the paroxysm of pain, the abdominal musculature had a boardlike rigidity, which disappeared completely as soon as the pain remitted. Light stroking of the skin over the epigastrium seemed to afford some relief, but deep pressure was painful. Epigastric tenderness was present during each paroxysm and persisted for some hours after the attack was over. The onset of pain was always accompanied by the disappearance of audible peristalsis, which returned at the conclusion of the paroxysm. Pilomotor changes were not a prominent feature of the attacks, though with severe pain goose-flesh was present on the abdomen.

The blood pressure and pulse rate showed marked changes with the paroxysmal pain as indicated in chart 1. The upper line indicates pulse rate, and below it are shown the systolic and diastolic blood pressures in an attack which was permitted to subside spontaneously without medication of any kind. The incidence and the relative severity of the pain are shown by the shaded areas at the

bottom of the chart. It is evident that blood pressure and pulse rate rise markedly during each paroxysm. These changes are not due to the pain itself, as they far exceed the usual range of changes in blood pressure seen in acute abdominal conditions, and because they precede the first symptoms of discomfort. It was possible to foretell by some seconds the onset of pain by a slight increase in both pulse rate and blood pressure. In another attack in which the patient was too restless to permit frequent blood pressure determinations, the pulse rate rose to 152 and the blood pressure to 190 systolic and 110 diastolic. As shown in the chart, diastolic pressure returned to lower levels in the latter paroxysms until at the end of the attack it reached 45, sometimes as low as 40. Systolic pressure remained practically constant, except during the actual paroxysm. Both pressures were normal within several hours after the seizure.

The fingers at times assumed a position faintly suggestive of tetany. The patient complained of tingling in the fingers and toes on two occasions. A ques-

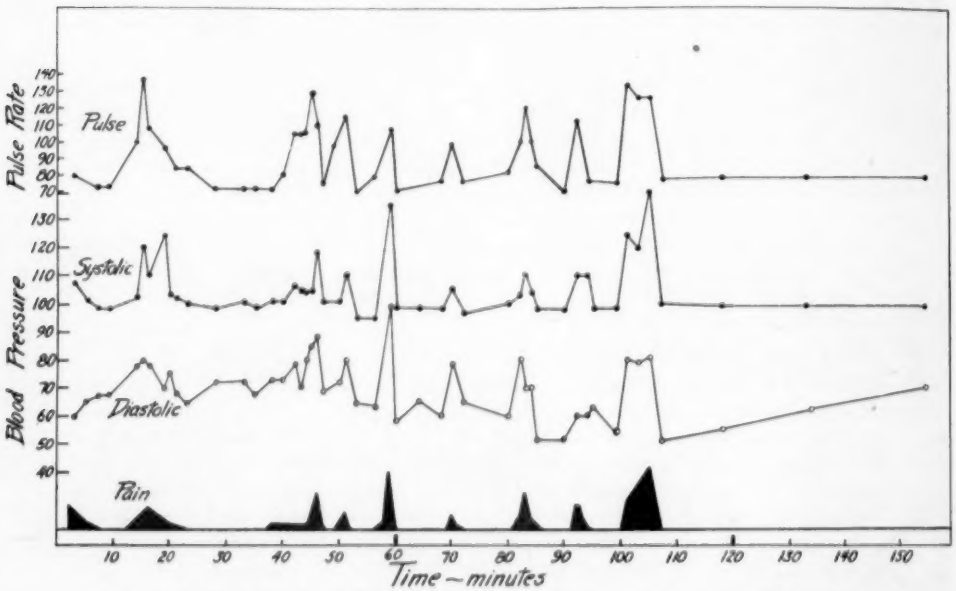

Chart 1.—Changes in pulse rate and blood pressure during an attack of pain subsiding without medication. The severity of pain is indicated by the height of the shaded areas.

tionable Chvostek sign was present in several attacks, but the Trousseau sign was always negative. Unfortunately, this phase was not studied in relation to blood hydrogen ion concentration, but blood calcium figures were consistently within the normal range.

Between paroxysms of pain the child lay relaxed, with her eyes closed and her arms extended over her head. The facial flush remained, however, until after the final paroxysm, when it disappeared rather suddenly. On several occasions the hands were reddened and excoriated over the ulnar surfaces due to friction on the abdomen, or to wringing of the hands during the periods of pain, which also caused the child to writhe and assume every variety of position in an effort to obtain comfort. These contortions were most striking in degree and usually opisthotonic.

Fever was observed in several of the severe attacks, rising to 102 F. in one instance. Blood counts showed a leukocytosis in every attack, the highest being 26,000 per cubic millimeters with 89 per cent neutrophils, 6 per cent lymphocytes, 4 per cent large mononuclears and 1 per cent eosinophils. The urine which was usually passed in large quantities after each attack, showed sugar in three instances, through the blood sugar on two examinations was normal. No permanent ill effects were observed after the attacks, except on the first admission when continued vomiting produced dehydration and starvation acidosis.

Special Studies.—The blood plasma chlorides, carbon dioxide content and urea nitrogen were normal in the intervals between attacks. The blood sugar and calcium were normal both during and between paroxysms. The Wassermann reaction of the blood and spinal fluid was negative. A positive reaction to the tuberculin test was obtained with 0.01 mg. of old tuberculin. A gastric analysis showed an absence of free hydrochloric acid and a low total acidity, the highest being 18, one hour after the test meal.

A roentgen examination of the gastro-intestinal tract showed pyloric spasm with practically no gastric peristalsis. The pyloric region did not fill, and the conclusion was that the slight defect in the duodenum and pylorus was probably due to prolapse of the mucosa or to polyp. During an acute attack, fluoroscopic examination of the stomach showed moderate dilatation with complete absence of peristalsis. No bismuth passed into the duodenum. This verified the auscultatory observations, according to which peristalsis seemed to be absent during the paroxysm of pain.

At this time (November, 1927) owing to the roentgen interpretation the patient was transferred to the surgical service for exploratory laparotomy. At operation, the stomach was negative to palpation. A few adhesions over the pylorus were released, and the incision was closed. Within a few days the pain recurred; since operation the incidence of the attacks has been the same as before. A few enlarged mesenteric lymph nodes were observed in the exploration, and roentgen examination later showed calcification in some of these.

Further medical study on readmission to the pediatric ward showed that there was no significant sensitization to foreign proteins, with the exception of a slight reaction to goose feathers and to spinach. Repeated roentgen examinations of the spine showed no evidence of Pott's disease and there has been no evidence of paravertebral tuberculosis. The basal metabolism was plus 11 per cent. The spinal fluid was normal cytologically and the pressure was not raised. On several tests, the stools were negative for parasites, ova and occult blood.

The atropine test of Danielopolu and the marked sensitivity to epinephrine were the most significant observations in favor of the diagnosis of sympathicotonia. The atropine test involves the complete paralysis of the vagus by atropine in order to release the sympathetic nervous system from vagal inhibition. Under these condition, sympathetic tone can be measured by the heart rate. Atropine sulphate was introduced intravenously in ascending doses on successive days, beginning with $\frac{1}{300}$ grain (0.0002 Gm.). It was found that $\frac{1}{150}$ grain (0.0004 Gm.) was necessary to produce complete vagus paralysis, as tested by the effect of posture on the heart rate; in several instances it was checked by the oculocardiac reflex. The average heart rate in the recumbent position before atropinization was 96, while after vagus paralysis the average rate was 152. According to Danielopolu, the normal person under these circumstances should have a rate of from 120 to 128. Evidently the escape observed was far in excess of the normal, even when allowance was made for the lability of the pulse in childhood.

The difference in the rate before and after atropine was referred to by Danielopolu as "vagus tone," the normal range being between 38 and 58. In this instance the difference was 56, indicating normal vagus tone. According to these criteria the case fell into the class designated as "sympathicotonia."

A marked sensitivity to epinephrine is a characteristic observation in this condition. In order to test the diagnosis further, 5 minims (0.3 cc.) of a 1:1,000 solution of epinephrine was injected intramuscularly. A profound reaction followed. The patient complained of feeling "trembly" almost immediately, and the

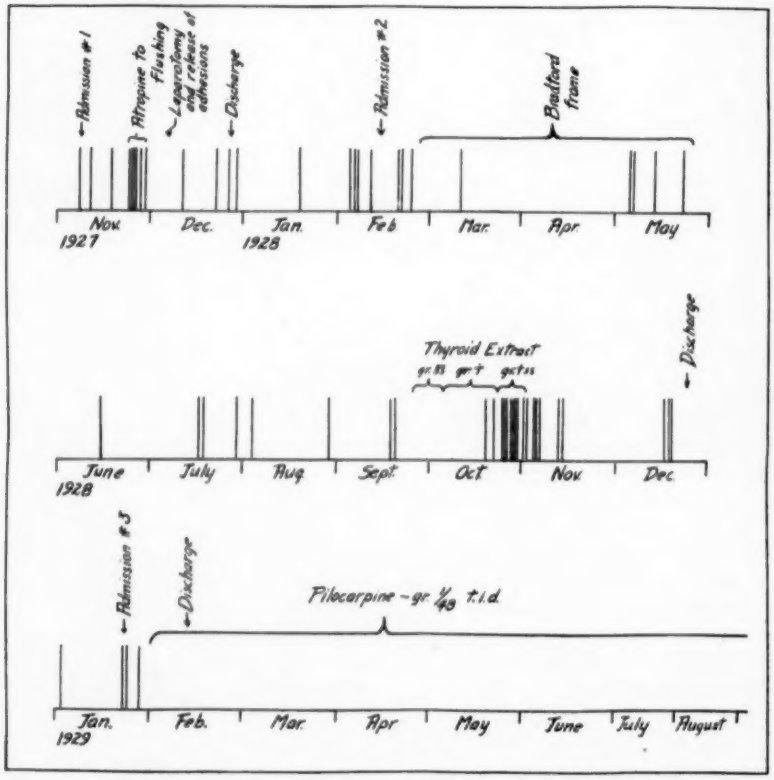

Chart 2.—Dates on which attacks occurred from November, 1927, to Sept. 11, 1929. Each attack is indicated by a vertical line. Therapeutic procedures are shown above each line.

extended hands showed a marked coarse tremor. The mucous membranes were dry, and the patient complained of thirst. Her face was pale, with the pupils slightly dilated. Within three minutes after the administration of epinephrine she complained of severe pain under the base of the sternum resembling that in her attacks except for the higher position. There was slight pain in the occipital region. Four minutes after the onset of symptoms, the blood pressure was 150 systolic and 110 diastolic, and the pulse rate 100. The symptoms gradually disappeared and the patient felt normal one hour later. This sensitivity to epinephrine

was regarded by Csépai [3] as the most reliable indication of increased tonus of the sympathetic nervous system.

Therapy.—During the twenty-two months in which this patient was under observation numerous therapeutic procedures were used, as indicated in chart 2 in which each attack is shown by a vertical line. The measures used to prevent the occurrence of the attacks are shown above the lines. On account of the pylorospasm observed on the first admission, atropine sulphate was administered to the point of toxic effects. The frequency of attacks was greater at this time than during the subsequent period of observation. Laparotomy in November, 1927, likewise failed to influence the condition; apparently the periduodenal adhesions, then freed, had nothing to do with the symptoms. The discovery of enlarged calcified lymph nodes in the mesentery may be of importance.

Because of the possibility of latent Pott's disease, in spite of the negative roentgen examinations of the spine, the child was placed on a Bradford frame for three months. During this time there were five typical attacks.

Following the atropine and epinephrine tests it was felt that vagotropic medication might be of aid by increasing peristalsis and avoiding the inhibition which seemed to be associated with the sympathicotonic crises. It was found that physostigmine salicylate, 1/60 grain (0.001 Gm.), administered intramuscularly at the beginning of an attack caused the symptoms to disappear within seven to ten minutes, always, however, with vomiting of large amounts of food. It has been mentioned that vomiting without medication failed to relieve the symptoms. Simultaneously with the relief of pain audible peristalsis was much increased with continuous clicks and frequent borborygmus. The patient usually perspired and complained of weakness, but within an hour was feeling well. Numerous attacks were thus aborted after having been in progress for ten to fifteen minutes. Intravenous pilocarpine hydrochloride, 1/40 grain (0.0016 Gm.), produced the same effect, but with more striking increase in peristalsis.

The oral administration of pilocarpine hydrochloride in the dosage of 1/24 grain (0.0027 Gm.) was found to be the most successful means of stimulating peristalsis and of giving relief from the pain. Peristalsis was increased more gradually by this administration, and relief followed within ten to twenty minutes, but without vomiting.

With this means of aborting the attacks, it was felt safe to test the condition further by the administration of thyroid extract in ascending doses in order to observe the effect of sympathetic stimulation on the frequency of the attacks. When the dosage had been increased to 1½ grains (0.097 Gm.) three times daily (chart 2), there was a sudden increase in the number of seizures. This series was more severe than any observed during the previous months of hospitalization. The attacks were aborted by pilocarpine, but nevertheless they occurred almost daily over a period of two weeks, and on one occasion twice in the same day. It seems significant that the two periods which showed the greatest frequency of attacks were those immediately related to administration of atropine which released the sympathetic by vagus paralysis, and to thyroid extract which stimulated the sympathetic nervous system directly. There was no increase in basal metabolism during or following the administration of thyroid.

After a short period of observation the patient was readmitted to the hospital for a short time for the continuous oral administration of pilocarpine in the dosage of 1/48 grain (0.0013 Gm.) twice daily for a time, and later three times a day. The patient has been receiving this treatment for seven and a half months, and during

3. Csépai, K.: Sympathicotonie und Vagotonie, Ztschr. f. d. ges. exper. Med. **56**:206, 1927.

this period has been entirely free from pain. The drug was discontinued by the patient on several occasions. A vague feeling of discomfort followed, but there was no pain. The dosage was resumed, and since then there have been no symptoms. She has gained almost 15 pounds in weight and attends school regularly.

COMMENT

The attention of clinicians was directed to the autonomic nervous system by Eppinger and Hess [4] in their description of vagotonia, which is regarded as a state of irritability of the parasympathetic system accompanied by abnormal sensitivity to pilocarpine. Sympathicotonia, the opposite of this, is characterized by hyperactivity of the sympathetic innervation and can be identified by the reaction to epinephrine and atropine. The attacks of pain in functional disorders of the autonomic nervous system are sometimes extremely severe and dramatic and have led to operation for ruptured gastric ulcer, according to Cornioley,[5] and for appendicitis, as described by Klotz.[6]

The diagnosis of these conditions is sometimes difficult becaue of the overlapping of sympathetic and parasympathetic symptoms. This confusion has led some clinicians to regard the entire concept with skepticisim (von Bergmann [7]). Admittedly the literature is in large measure in need of careful revision because of numerous discrepancies. This case is reported not because of the diagnosis per se, but because of the striking relief from severe abdominal pain, apparently of functional origin, by the use of pilocarpine. This drug has apparently not been used to any extent except in diagnostic tests.

An important feature of this case is the early onset of symptoms, which began when the patient was 9 months of age. In such cases of long-standing symptoms, in which the paroxysms are accompanied by other evidences of sympathetic stimulation and in which there is no evidence of an organic condition, the possibility of sympathicotonia should be considered.

Stimulation of the sympathetic dilates the pupils, produces sweating, increases the heart rate, elevates blood pressure, diminishes gastric acidity (Moll and Flint [8]), inhibits gastric and intestinal peristalsis, diminishes gastro-intestinal tonus, and increases the tonus of the ileocolic sphincter and possibly that of the pylorus. All of these phe-

4. Eppinger and Hess: Die Vagotonie, eine klinische Studie, Berlin, 1910.

5. Cornioley, M.: Névrose grave du plexus solaire simulant une perforation gastrique, Arch. d. mal. de l'app. digestif **15**:443, 1925.

6. Klotz, R.: Ueber Reizzustände im vegetativen Nervensystem, ein Beiträg zur Appendizitisfrage, München. med. Wchnschr. **74**:538, 1927.

7. Von Bergmann, G.: Handbuch der inneren Medizin, Berlin, 1925, vol. 5.

8. Moll and Flint: Depressive Influence of Sympathetic Nerves on Gastric Acidity, Brit. J. Surg. **16**:62, 1928.

nomena were observed in the case described. The leukocytosis observed is probably to be explained on the basis of increased muscular activity, analogous to that of exercise or the action of epinephrine.

The gastro-intestinal tract is innervated by both divisions of the vegetative nervous system, and its motility depends on a proper balance between the inhibitory sympathetic and the motor parasympathetic tonus. Whether the pain was due to distention of the stomach, as suggested by the roentgen observations and the absence of peristalsis in the paroxysms, must still be a question. It seems to be the most probable explanation, as intramuscular pilocarpine and physostigmine (eserine) produced vomiting and peristalsis, with almost immediate relief. Moreover oral administration of pilocarpine increased peristalsis gradually so that presumably the stomach could empty more slowly in the normal manner. The continuous daily administration of small amounts of pilocarpine probably acts by slightly increasing peristalsis and preventing gastric and intestinal stasis.

The relation of these symptoms to the calcified lymph nodes in the mesentery is also of interest, although to postulate direct irritation of the sympathetic network by these glands would require their presence at 9 months of age, while the patient was still on breast feedings. This seems unlikely. It would be of the greatest interest, however, to observe the effects of pilocarpine in the crises of tabes mesentericus.

In conclusion, this case seems to be an example of true sympathicotonia in childhood. The excellent therapeutic effects of pilocarpine recommend the consideration of this diagnosis and treatment in cases of long standing abdominal pain in which no organic cause can be discovered. Moreover, it seems probable that careful examination of patients suffering from so-called gastric neurosis may yield a certain percentage of cases in which the patient may be markedly benefited by the administration of pilocarpine.

SUMMARY

A case of sympathicotonia in a girl, aged 10, is reported. The patient had suffered severe attacks of epigastric pain beginning at the age of 9 months, and occurring on the average every two or three weeks. Each attack was accompanied by profuse perspiration, constipation, dilatation of the pupils, marked increase in blood pressure and pulse rate, absence of gastric and intestinal peristalsis, and epigastric tenderness. Leukocytosis and glycosuria were also observed. The reaction to atropine and the marked sensitivity to epinephrine indicated hyperactivity of the sympathetic portion of the autonomic nervous system. Moreover, atropine and thyroid extract seemed to increase the frequency and severity of the attacks.

Appendectomy at 3 years of age, and exploratory laparotomy with release of periduodenal adhesions at 10 years failed to relieve the symptoms. On account of the evidence of increased sympathetic tonus, vagotropic medication was used. Single attacks were aborted by the administration of physostigmine (eserine) intramuscularly and pilocarpine intravenously. The daily oral administration of pilocarpine in small doses was followed by complete relief from symptoms.

The possible significance of functional disturbances of the vegetative nervous system in so-called gastric neuroses is considered.

A SAFE SAFETY-PIN *

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ST. PAUL

Fear of safety-pins is universal among parents of small children. This fear is no less real because the danger lies hidden behind a name that conveys a false assurance of safety. My clinical experience in the practice of pediatrics has led to the realization that the so-called safety-pin constitutes a menace as genuine as the fear encountered. Despite the general knowledge of the danger of the open safety-pin, its constant use makes for an almost unavoidable source of accident varying in degree of severity from scratches on the skin to death from internal injuries.

That the safety-pin is a decidedly important factor in the field of foreign body injury is shown by the figures from Jackson's Clinic in 1928.[1] Of 1,728 cases of foreign body injury to the esophagus and the air passages, approximately 12 per cent were due to the safety-pin, and in almost every instance the pin was open. Myerson at Mount Sinai, in 39 cases of ingested foreign bodies, found 11 cases due to the safety-pin, in 9 of which the pin was open. There was one death. Among the severe injuries and fatalities cited by Jackson,[2] Manges,[3] Myerson [4] and Imperatori [5] are: strangulation by an open safety-pin in the pharynx, acute mediastinitis due to puncture of the esophageal wall, hemorrhage due to puncture of the aorta and great blood vessels, pericarditis due to puncture of the pericardium, pneumonias, pleuritis, shock due to pas-

* Submitted for publication, Nov. 23, 1929.

* From the Children's Hospital, and the Pediatric Department of the Miller Hospital.

* Presented at the meeting of the Northwestern Pediatric Society, Oct. 23, 1929.

1. Manges, W. F.: Roentgen Observations on Safety-Pins as Foreign Bodies, Arch. Otolaryng. **9**:245 (March) 1929.

2. Jackson, C.: Peroral Endoscopy and Laryngeal Surgery, published by the Laryngoscope Company, St. Louis, 1915.

3. Manges, W. F.: Roentgen Observations on Safety-Pins as Foreign Bodies, Arch. Otolaryng. **9**:245 (March) 1929; Roentgen Diagnosis of Foreign Bodies in the Esophagus, Am. J. Roentgenol. **17**:44 (Jan.) 1927.

4. Myerson, M. C.: Foreign Bodies in Stomach and Intestine, Arch. Otolaryng. **8**:675 (Dec.) 1928.

5. Imperatori, C. J.: Pericardial-Esophageal Fistula Following Foreign Body in the Esophagus; Pneumopericardium; Autopsy Report, Laryngoscope **38**:268 (April) 1928.

sage of the bronchoscope or esophagoscope and acute edema following trauma. In the case of the ingested safety-pin that reaches the stomach, Dr. Jackson recommends removal by the gastroscope, but only with this in competent hands. If the pin passes the pylorus and the duodenal jejunal flexure, it will probably pass the remaining portion of the digestive tract. But any sharp object should be carefully watched, and if it remains stationary for five or six days or if evidence of peritoneal inflammation appears, surgical intervention must be considered.

Of all the metallic foreign bodies most frequently encountered, whether inhaled or ingested, the long sharp object such as a needle

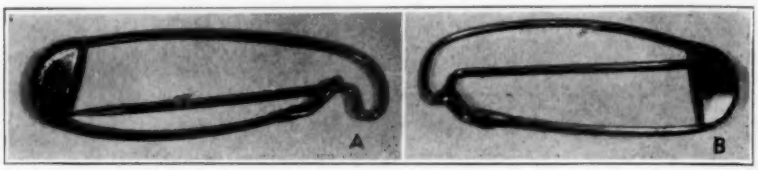

Fig. 1.—*A*, pin open; *B*, pin closed.

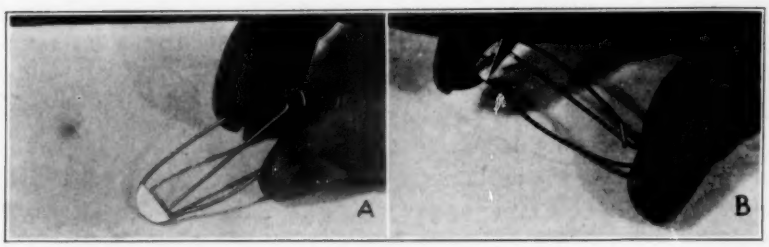

Fig. 2.—*A*, to open, press pin on sides; *B*, to close, press pin on ends.

or an open safety-pin, is most dangerous. The long sharp object seeks the most dependent portions of the lung, or in the esophagus or the intestine may become lodged in the structural wall. The safety-pin is doubly dangerous owing to its pronged construction. When lodged in the esophagus of an infant, spasm occurs, burying the pinpoint. The spring portion is down except in those cases in which the pin has been regurgitated from the stomach. Of course, there is really no limit to the various positions a pin can assume in the body, which makes its removal a highly complicated procedure requiring specialized technic, and elaborate instruments. When an article in daily use, such as the safety-pin, causes the invention of such instruments as the Moser Safety-Pin Closer, the Moser Slot Bronchoscope, Tucker Forceps, the

Arrowsmith Closer, Clerf Cannula with fixing wire and the Clerf-Arrowsmith Closer, and the writing of chapters in medical books on the procedure and care in injuries due to it, it would seem high time that something be done about it from a prophylactic standpoint. The safety-pin has remained unchanged in over half a century. In a careful review of the literature, I can find but one attempt to better the present pin. In this instance, a transverse bar was placed at the middle of the

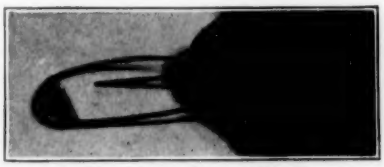

Fig. 3.—To insert, grasp pin at base and press laterally.

Fig. 4.—A comparison of old style and new style safety-pins open.

Fig. 5.—The pin may be conveniently used in every instance in which the old safety-pin could be, to fasten diapers, blankets, drainage tubes (as here), garters, etc.

pointed shaft to prevent swallowing.[6] In this day of mechanical perfection, however, one must keep in mind the idea of convenience. This, I believe, has been successfully combined in my pin with the feature of safety.

Suitable spring wire is bent to form a closed loop, and a reentrant end of the loop becomes the pin portion (fig. 1 *A*). Near its proximal

6. Richards, Lyman: Discussion, Tr. Am. Bronchoscopic Soc., April, 1928.

end, this pin prong has a small sharp bend that forms a lock. A sliding eye is arranged to allow opening and closing of the pin. When closed, the whole pin is under tension; the pin end of the prong is held securely in the keeper, and the sliding eye is locked in the bend at the proximal end (fig. 1 *B*). To open, press the pin on its sides. This releases the eye from its lock, and the pin snaps open (fig. 2 *A*). To close, press the pin on its ends and it snaps shut (fig. 2 *B*). To insert, grasp the pin near its proximal end and press laterally (fig. 3). By its construction the pinpoint is always guarded. The fingers of the operator are protected, and injuries to the wearer are prevented if the pin should

Fig. 6.—Pin used for fastening garters.

come open while in clothing. Being a closed link, the pin cannot be pulled apart. It operates quickly and easily, snaps open and snaps shut and is best used with one hand. It is comfortable because it always lies flat. It may be used conveniently in every instance in which the old safety-pin could be, to fasten diapers, blankets, drainage tubes (fig. 5), garters (fig. 6) and the hundred odd uses to which one puts a safety-pin, but with distinct advantage for the new pin in every case in which pull is put on the pin. In the old safety-pin, tension or pull on the pin causes it to spring apart. In the new pin, tension will serve but to strengthen its hold. Because the point is always guarded, the

pin will present only the problem of a smooth foreign body if accidentally inhaled or ingested.

In a recent experiment, the new pin was fed to a year old fox terrier at intervals of twelve hours, so that there would be two or three pins traveling through the digestive tract at a time. The pins used were of varying sizes and open. Each day the x-ray showed the positions of the pins to be that of normal progress through the alimentary canal. It was especially interesting to see one pin pass with the pinpoint foremost. Figure 7 shows two pins passing, one must necessarily be point foremost.

Fig. 7.—X-ray picture of two open pins passing through the digestive tract of a year old fox terrier, one pin with pinpoint foremost.

Thorough trials of the pin at the pediatric department of the Miller Hospital and the Children's Hospital have proved that the pin has the following advantages:

1. It is safe.
2. It is convenient. It is easily and quickly opened and closed and may be operated with one hand.
3. It protects the fingers of the operator.
4. It protects the wearer.
5. It is comfortable because the pin always lies flat.
6. It is strong and hard to bend out of shape.
7. It is a complete pin; that is, it may be used for all purposes.

PELLAGRA SECONDARY TO GASTRO-INTESTINAL DISEASE *

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During recent years the literature has afforded a number of examples of typical pellagroid syndrome associated with or following some specific gastro-intestinal disease.

Rolph,[1] in 1916, recorded the case of a woman, aged 41, who was seen in March, 1915. At that time she gave a history of excessive expectoration and increasing weakness and dysphagia of three months' duration. When seen again three months later, she had developed pellagroid dermatitis of the face, hands and forearms and was extremely emaciated. Death occurred the following month, and the autopsy showed carcinoma that involved the lesser curvature and cardiac orifice of the stomach.

In 1919, Bryan [2] described the case of a man, aged 49, who for twenty years had had a condition suggestive of peptic ulcer. For two years he had lost weight, and for twelve months he had vomited increasingly, during which time a typical pellagroid dermatitis and stomatitis had developed. Operation showed the presence of carcinoma of the stomach. Gastrectomy and gastroduodenostomy were performed, and the patient made a rapid recovery from the symptoms of pellagra.

The following year, Graves [3] referred to three cases in patients operated on for symptoms of gastric ulcer in whom an acute active pellagra with dermatitis and marked gastro-intestinal symptoms developed within forty-eight hours. In two of the patients, a large gastric ulcer was found at operation.

In studying the records of 144 cases of pellagra in Massachusetts, Shattuck,[4] in 1923, found one in which cancer of the stomach and one in which cancer of the rectum was associated with the pellagra. He also reviewed the records of 500 cases of cancer of the stomach, and

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* From the Children's and Infants' Hospitals, Boston, and the Department of Pediatrics, Harvard Medical School.

1. Rolph, F. W.: Gastric Cancer, Canad. M. A. J. **6**:323 (April) 1916.

2. Bryan, R. C.: Cancer of Stomach with Associated Pellagra, Virginia M. Monthly **46**:107 (Aug.) 1919.

3. Graves, M. L., in discussion on Roberts, S. R.: Types and Treatment of Pellagra, J. A. M. A. **75**:21 (July 3) 1920.

4. Shattuck, G. C.: Factors Apparently Influencing Development of Pellagra in Massachusetts, Boston M. & S. J. **188**:889 (June) 1923.

in one of these was a report of a symmetrical lesion of the skin of the hands, which, though it had not been diagnosed as pellagroid, he considered as showing strong evidence in favor of this diagnosis.

Bender,[5] in 1925, reviewed the cases of Rolph, Bryan and Graves and drew particular attention to the probable secondary characteristics of the pellagra. He reported three cases, in the first of which pellagra developed during jejunal feeding preparatory to gastro-jejunostomy. In the second and third cases, the pellagroid symptoms developed during the course of pyloric obstruction due to carcinoma. A transitory improvement was noted in one patient following gastro-enterostomy.

In the same year, Joyce and Seabrook[6] reported the development of pellagra in a patient who for seven years had had stricture of the rectum which had followed an operation for hemorrhoids. In order to produce a soft stool of small bulk, the patient had adopted a diet that was markedly deficient in protein and in fresh vegetables. Operation for cure of the stricture was followed in one month by rapid reappearance of the skin lesions which at the time of the second operation had not been in evidence.

Nuzum,[7] also in 1925, reported two cases of pellagra that were associated with annular carcinoma involving the terminal portion of the ileum; in the first, the patient had symptoms for three months before the appearance of skin lesions; in the second, the skin and gastro-intestinal manifestations were practically coincident.

In 1926, Barnes[8] gave a full antemortem and postmortem report in the case of a colored woman, aged 24, who had developed a typical pellagroid syndrome while in a hospital under treatment for a chronic ulcerative colitis. On admission, the patient gave a history of chills and fever of six months' duration and of severe diarrhea with a foul, rectal discharge for one month. In the hospital, on a high caloric, nonresidue diet, the patient developed typical dermatitis and dementia. Death occurred of a terminal bronchopneumonia fourteen months after the onset of the gastro-intestinal symptoms. Postmortem examination showed a condition of the intestines that was identical with a severe chronic bacillary dysentery, although examination of the stool had been repeatedly negative for dysentery organisms. Barnes commented that

5. Bender, W. L.: Pellagra Secondary to Lesions of Stomach Interfering with Nutrition, J. A. M. A. **84**:1250 (April 25) 1925.

6. Joyce, T. M., and Seabrook, D. B.: Stricture of Rectum as Indirect Cause of Pellagra, Northwest Med. **24**:284 (June) 1925.

7. Nuzum, F. R.: Pellagra Associated with Annular Carcinoma of Terminal Portion of Ileum, J. A. M. A. **85**:1861 (Dec. 12) 1925.

8. Barnes, J. M.: Typical Pellagra Syndrome Developing in Patient with Chronic Ulcerative Colitis While Under Hospital Treatment, Ann. Clin. Med. **4**: 552 (Jan.) 1926.

"even on a highly nutritious diet the presence of such gastro-intestinal lesions might be sufficient to give rise to protein deficiency, in so far as absorption from the tract is concerned."

In 1926, O'Leary [9] described five cases of pellagra in patients who were admitted to the Mayo Clinic, which he considered secondary in character. In all five cases the primary disease antedated the appearance of the skin lesions. He commented on the possible significance of intestinal parasites that were found in the stools of three patients.

REPORT OF CASES

CASE 1.—A woman, aged 58, had had stomach trouble for fifteen years before admission. A gastro-enterostomy had been performed for peptic ulcer four years before admission. Gastric pain and vomiting had recurred for nine months, and the patient had limited her diet to bread and cereal. At examination, the patient showed mild dermatitis of the hands and emaciation. At operation the old anastomosis was disconnected, and gastro-enterostomy was again performed. The patient continued to limit her diet, and when seen four months later had typical pellagroid skin lesions and depression. Some improvement occurred on a mixed diet.

CASE 2.—A man, aged 63, gave a history of abdominal pain of six months' duration which had been relieved by vomiting. For one month he had chewed but not swallowed his food, and during this time, typical pellagroid dermatitis had developed. A partial gastrectomy for operable carcinoma of the pylorus was followed within four days by wild delirium and dementia. The patient died ten days later.

CASE 3.—A man, aged 55, had lost weight for a period of eighteen months and had had gastric distress after eating for three months; his diet was limited to soup, oatmeal and milk. Severe diarrhea and subsequently an acute erythematous desquamating dermatitis developed during the period of limited diet. The patient died ten days after admission. At postmortem examination, a carcinoma of the descending colon was found.

CASE 4.—A man, aged 42, with a history of stomach trouble for a period of fifteen years, had had a gastro-enterostomy performed for duodenal ulcer nine months before admission. Symptoms recurred after one month, and in spite of a second operation four months later, the patient continued to have severe vomiting. Diarrhea, dermatitis of the hands and soreness of the tongue developed three months after the second operation; the diet at this time was well mixed, containing adequate protein and vitamins. Pylorectomy for indurated duodenal ulcer was performed, and jejunal feeding was instituted temporarily. Delirium and dementia developed on the third day after operation, lasting for two weeks. The patient then made a good recovery on a diet containing yeast and cod liver oil.

CASE 5.—A woman, aged 33, a known psychotic patient, drank lye six months before admission; she subsequently developed stricture of the esophagus and, consequently was limited to a fluid diet. Dermatitis, diarrhea and glossitis developed three months later. The patient died of terminal bronchopneumonia. Her mental condition made forced feedings and treatment unsuccessful.

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9. O'Leary, P. A.: Secondary Types of Pellagra, M. Clin. N. Amer. **10**:647 (Nov.) 1926.

AUTHOR'S CASE

CASE 6.—*History.*—A. V., an Italian boy, aged 9 years and 10 months, was referred to me by the school physician because of loss of weight and appetite and diarrhea which had persisted for three months. The family history was essentially unimportant. There were five living siblings who were all up to the normal weight for their ages, and who had no evidence of tuberculosis or pellagra. The family was a poor but not destitute Italian family who lived in a five room tenement in Lawrence, Mass.

Fig. 1.—(A. V.) Showing the extreme degree of wasting.

The child had been a normal infant. He had had pertussis followed by measles at 4 years of age, but since then had been well until the present illness. There had been no known tuberculous contact.

The patient had received the customary diet of an Italian family consisting largely of macaroni, potatoes and bread. They had used 1½ quarts of milk daily, fresh vegetables rarely, and meat and eggs frequently, but in small amounts. The patient's appetite had been increasingly poor during the present illness. He had been apparently well until February, 1929 (three months before admission), when he began to suffer from loss of weight and appetite, lassitude, diarrhea and abdominal pain. The latter occurred shortly after meals; it seemed to be in the left upper quadrant, was never severe and was relieved by a bowel movement. For three weeks before admission, symptoms became aggravated. Diarrhea was severe

(up to twelve watery stools a day without visible blood or mucus), and loss of weight became more rapid (5 pounds [2.3 Kg.] within two weeks, the patient having lost from 50 to 60 pounds [22.7 to 27.2 Kg.] during the previous two months). During this time, there gradually appeared a nonpruritic symmetrical pigmentation of the skin on the dorsum of both hands. The child became increasingly apathetic, though he remained at school until within four days of admission. For five or six days before admission, crusted lesions had appeared on the face and had spread to the scalp and the neck. The patient was admitted to the Children's Hospital on April 30, 1929.

Fig. 2.—(A. V.) Showing gauntlet distribution of lesions on the hands.

Physical Examination.—Physical examination showed an extremely emaciated Italian boy weighing 44 pounds (20 Kg.). His height was 50 inches, temperature 101 F., pulse rate 130, respiration 25 and systolic blood pressure 120. Mentally, the patient was cooperative but extremely apathetic and depressed.

There were crusted papular impetiginous lesions on the scalp, neck and face. Over the anterior tibial surfaces and the bridge of the nose and in sharply demarcated "gauntlet" distribution on the dorsum of the hands, the skin showed markedly roughened and dry appearance; on the hands, there was deep brown pigmentation over the gauntlet area; this pigmentation was particularly dark across the metacorpophalangeal and phalangeal joints dorsally.

The tongue was smooth and slightly reddened, with moderate atrophy of villi. The teeth were in good condition, and the throat was normal. There was no impairment of the percussion note, the air entry was equal and there were no adventitious sounds, cough or dyspnea. The abdomen was not distended, but was soft and slightly doughy on palpation. There was no localized or shifting dulness, but there was a slight tenderness in the epigastrium. The spleen and liver were not felt, and the results of the rectal examination were negative.

Neurologic Examination.—The results of the neurologic examination were essentially negative, except for generalized weakness. There were no mental symptoms other than extreme depression and capricious appetite.

Laboratory Observations.—The Pirquet test was positive, 1 in 1,000. Examination of the blood on May 2 showed the following: hemoglobin, 41 per cent; red blood cells, 3,920,000; white blood cells, 5,400; polymorphonuclears, 27 per cent; myelocytes, 2 per cent; small lymphocytes, 63 per cent; medium-sized lymphocytes, 1 per cent; blastophils, 1 per cent, and mononuclears, 6 per cent.

On June 22, the polymorphonuclears numbered 62 per cent; lymphocytes, 22 per cent; mononuclears, 10 per cent; abnormal mononuclears, 4 per cent; and eosinophils, 2 per cent; the monocyte-lymphocyte ratio was 1:22. Examination of a smear stained by the supravital method was made by Dr. L. K. Diamond, who reported: "The ratio of monocytes to lymphocytes and the presence of epithelioid cells are suggestive of an active progressive tuberculous process." Blood cultured (repeated) and agglutination reactions for the typhoid-dysentery group were negative. The Wassermann reaction was negative. There were no abnormal constituents in the urine on repeated examination. The stools were foul, light brown, watery or semi-solid, but contained no blood or pus. The benzidine test was positive. The typhoid-dysentery group was not found.

On June 3 and 4, the acid-fast and alcohol-fast organisms were found after digestion of fecal material with sodium hydroxide. A guinea-pig was given an injection with a concentrated portion of this fecal material and showed tuberculosis at autopsy.

Gastric Analysis.—Gastric analysis was made by Dr. A. V. Neale five hours after the last meal.

Results of Gastric Analysis

	Free Acid	Total Acid	p_H	Volume
Resting	0.0	....	...	.....
Histamine.....0.2 Gm. injected subcutaneously				
Fifteen minutes later	49.5	55.0	1.9	45 cc.
Thirty minutes later	35.0	50.0	2.0	35 cc.
Forty-five minutes later	75.0	77.5	1.5	20 cc.
One hour later	67.5	70.0	1.6	15 cc.

Dr. Neale said, "This is an excellent response for this age."

Roentgen Report.—Dr. E. C. Vogt made a roentgen examination. The lungs (examined at one month intervals) showed no evidence of disease. The abdomen revealed several calcified mesenteric glands.

On June 11, the esophagus and stomach appeared to be normal. The opaque barium sulphate in the small and large bowel was mixed with a large amount of fluid, while the rugae and haustrae did not stand out well. After twenty-four hours, the barium was completely evacuated. The absence of the rugae and

haustrae, the large fluid content, and the hypermotility seemed to indicate a generalized enterocolitis.

Clinical Course.—Throughout his stay in the hospital, from April 30 to July 30, 1929, the patient had a daily temperature fluctuating from 99 to 103 F. Diarrhea was constant; there were from six to eight stools a day. They were foul and watery. The patient was put on a high protein diet, low fat and carbohydrate diet, with the addition of Brewer's yeast, but there was no remission of symptoms. He was seen by Dr. A. W. Cheaver and Dr. L. T. Royster, who considered the skin lesions diagnostic of pellagra. Tubercle bacilli were subsequently identified in the stools, and the patient was given a high caloric, mixed diet with artificial light to the abdomen. On June 1 he was given a transfusion with 350 cc. of citrated blood, after which there was a slight temporary improvement in his general condition. On July 30, he was transferred to Lakeville State Sanatorium, where he died on Aug. 23, 1929.

COMMENT

This case represents what may be regarded, I think, as a case of pellagra developing secondarily to a tuberculous enterocolitis. The latter diagnosis was made on the finding of the tubercle bacilli in the stools, which in view of the negative roentgenogram of the chest and the absence of cough could not be attributed to swallowed sputum. The roentgen appearances of the gastro-intestinal tract, the positive Pirquet reaction and the studies of the blood served as confirmatory evidence. The severe diarrhea and hypermotility of the tract were probably sufficient to interfere with absorption to the extent of causing a true deficiency of either vitamin or protein, although in view of the present knowledge of the actual mechanism of vitamin utilization such a hypothesis can be regarded only as speculative. A point of minor interest is the normal gastric secretion of hydrochloric acid in this case, an observation more common in pellagra that occurs in childhood, according to Givens,[10] than in adult life.

The diagnosis of pellagra, as in all the cases quoted, rested ultimately on the presence of a typical dermatitis; the gastro-intestinal and mental symptoms were less characteristics and attributable per se to a much greater variety of causes. Snyder[11] said that in the pellagra of childhood the skin manifestations are always the earliest recognizable symptoms of the disease. It is not, therefore, possible to say absolutely definitely that the tuberculosis antedated the pellagrous condition, (diarrhea, loss of weight and anorexia could be attributed to either), but in view of the late appearance of the skin lesions and the fact that the diet, though limited was not grossly deficient, it seems reasonable to suppose that this was the cause.

10. Givens, M. H.: Analysis of Stomach Contents from Pellagrins, Am. J. M. Sc. **155**:221 (Feb.) 1918.

11. Snyder, J. R.: Pellagra in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1923, vol. 2, p. 890.

In all probability a detailed study of any large group of patients with pellagra would afford at least isolated examples of coexistent gastro-intestinal disease (the high incidence of intestinal parasites, although often of doubtful pathogenesis, in the pellagrous bowel is well recognized), but in the cases cited herein the association was sufficiently close to suggest a direct etiologic factor in the pellagroid syndrome. Such cases of pellagra have been described as secondary.

The increasing weight of evidence adduced by Goldberger [12] and others in favor of a dietary insufficiency which was possibly deficient in a vitamin "P-P" similar to but not identical with water-soluble B, ultimately responsible for the occurrence of pellagra, would seem to indicate this as the rational standpoint for interpreting these cases. Thus they may be regarded as falling into three classes:

1. The class in which the diet was voluntarily limited on account of gastro-intestinal symptoms, e. g., the case of rectal stricture in which a stool of small bulk was desired cited by Joyce and Seabrooke.

2. The class in which the diet was not per se necessarily insufficient, but in which vomiting from, for instance, gastric carcinoma or a malfunctioning gastro-enterostomy interfered with the retention of food. In the cases observed by him, O'Leary considered the mechanical interference caused by the various primary lesions to be the predisposing factors in the development of the pellagra, but he also commented on the frequent voluntary restriction of diet that followed the onset of gastric symptoms.

3. The class in which gastro-intestinal disease interfered with the adequate assimilation of a diet that had been retained. Barnes suggested this as the etiologic factor in the case of chronic ulcerative colitis with severe diarrhea described by him. The case of A. V. herein reported should, I believe, be interpreted on this basis.

A fourth group might perhaps be differentiated in which acute fulminating pellagra is apparently precipitated by operation. This phenomenon was recognized by Goldberger,[13] and occurred in the three cases mentioned by Graves (who did not, unfortunately, specify whether there was any preexistent evidence of pellagra). O'Leary's second case showed increase in symptoms on the fourth day after operation, and in his fourth case dementia and delirium were observed on the third day. In Joyce and Seabrook's case also all the pellagroid symptoms were aggravated shortly after operation for relief from rectal stricture. It is probable that the severity of the dietetic regimen neces-

12. Goldberger, J.: Present Status of Our Knowledge of Etiology of Pellagra, Medicine **2**:79 (May) 1926.

13. Goldberger, J.: Pellagra in Tice, Frederick: Practice of Medicine, Hagerstown, Md., W. F. Prior Company, 1920, vol. 9, p. 212.

sitated by operations on the gastro-intestinal tract in patients whose diets have been deficient over a prolonged period is at least partly responsible for this, and suggests a real danger that may be incurred by limiting the diets of such patients too rigidly during the immediate preoperative and postoperative period.

In the twenty cases referred to, the primary lesion was cancer of the stomach in six, cancer of the rectum or ileum in four, gastric or duodenal ulcer with malfunctioning gastroenterostomy in two, gastric or duodenal ulcer with symptoms precipitated by operation in two, stricture of the esophagus in one, stricture of the rectum in one, chronic ulcerative colitis in one and tuberculous enterocolitis in one.

In one of Bender's cases, pellagra developed during jejunal feeding and in one of Graves' cases, following operation for suspected gastric ulcer.

Thus 50 per cent showed a malignant new growth of the gastro-intestinal tract causing more or less obstruction to the passage of food, while the four cases of nonmalignant gastric or duodenal ulceration were all complicated by operation. It seems not unlikely that the high percentage of malignant cases may be partly accounted for by the unmistakable nature of the lesion, attention thus being drawn to the coexistence of two distinct conditions. Conversely, the case of chronic ulcerative colitis cited by Barnes may well be typical of many cases which, seen for the first time after the onset of pellagroid symptoms, have been regarded as a primary pellagra, since ulceration of the cecum and colon is a frequent postmortem observation in the latter condition.

CONCLUSIONS

1. It is important to examine patients with pellagra for coexistent gastro-intestinal disease which may per se be responsible for a food deficiency. This would apply more particularly to the sporadic cases occurring in nonpellagrous localities when there is no demonstrable dietary insufficiency or when the patients fail to respond to an adequate diet.

2. There is danger of pellagra developing as a complication of prolonged gastro-intestinal disease when the intake or assimilation of food has been seriously interfered with.

3. There is an operative risk of precipitating pellagroid symptoms in mild cases and in patients who have previously been on restricted diets for long periods.

UNILATERAL EDEMA

REPORT OF A CASE IN AN INFANT AGED FOUR MONTHS*

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History.—A girl, aged 4 months, was first seen on Jan. 16, 1930, in the children's dispensary of the Lenox Hill Hospital, with a history of swelling of the left eyelids, noted shortly after birth. This swelling disappeared within a few days and was considered of no significance.

Three weeks later, at the age of 1 month, the whole left side of the body appeared swollen and larger than the right. This swelling, which included the face and extremities, would almost disappear at times, and after one or two days it would reappear. Except for these short intervals of improvement, the swelling was constant. At 3 months, an eczematous rash appeared on the lobe of the left ear and on the left cheek. Otherwise, the infant was normal. She seemed comfortable, and ate and slept well. The stools were formed.

Labor had been somewhat prolonged, but delivery had been normal at term. The birth weight was 9 pounds (4,082.33 Gm.). The infant was partly bottle fed, and at the time of examination was on a formula of whole milk, 48 ounces (1,419 cc.); dextrimaltose, 3 tablespoons; orange juice, carrots and tomato juice, and cod liver oil, 1 teaspoon daily.

The family history was negative. There were no other cases of edema in the family.

Examination.—Physical examination showed a well developed, well nourished female infant, weighing 13 pounds and 12 ounces (7,137 Gm.), with an extensive swelling of the left side of the body, including the scalp, face, neck, thorax, abdomen and both extremities (fig. 1). The skin was dry and clear, except for a scaly, moist, eczematous rash involving the lobe of the left ear and the left cheek. The anterior fontanel admitted four fingers. The left side of the face was larger than the right, and appeared edematous. The swelling did not extend beyond the median line, but included the whole face and neck, so that the nose, lips and chin appeared pushed to the right (fig. 2). The uvula was slightly edematous, but the tongue and tonsils appeared normal. The left side of the thorax was more prominent than the right. The lungs and heart were normal. The liver was palpable 3 cm. below the costal margin. The spleen was not felt. The left arm, from shoulder to finger-tips, appeared somewhat larger than the right. The skin was edematous, the hands and fingers appearing very much puffed. The left thigh, leg and foot had a similar appearance, the swelling extending to and including the toes, which were almost twice as large as those of the right foot (fig. 3). There was slight pitting on pressure.

Neurologic examination showed the reflexes to be normal. There were no motor paralyses or organic disease of the central nervous system. There was no appreciable difference in temperature between the two sides of the body.

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* Read before the Clinical Society of the Lenox Hill Hospital, Feb. 14, 1930.

* From the A. Jacobi Division for Children of the Lenox Hill Hospital, Service of Dr. Jerome S. Leopold.

On examination of the eye there were no pupillary disturbances, and the fundi were normal, but the left eyeball showed a slight enophthalmos due to disease of the sympathetic nerve fibers on the left side.

Roentgenograms revealed no evidence of bony changes compatible with a hemihypertrophy. The blood calcium was 9.3 mg. and the blood sugar, 114 mg. per hundred cubic centimeters of serum. The leukocytes numbered 4,400 per cubic millimeter; the lymphocytes, 61 per cent; the monocytes, 6.5 per cent; the polymorphonuclears, 29 per cent, and the eosinophils, 3.5 per cent. Urinalysis and vaginal smear gave negative results.

Therapy.—The only therapy tried was the use of epinephrine and later thyroid extract, without result.

Fig. 1.—Infant, aged 4 months, showing complete unilateral edema.

Etiology.—The edema of the whole left side of the body was not due to any obstruction of the left thoracic duct, because this duct normally drains the right lower extremity as well as the left side of the body, and in this patient the right side was not involved. It has been suggested, however, that there may be an anomalous development of the thoracic ducts so that the left duct may be draining the left side of the body and the right duct the right side. Angioneurotic edema could be eliminated, since the condition was not transient but persistent. Elephantiasis was ruled out by the nature of the swelling. There was no apparent infectious process.

Correlating the various examinations and suggestions made, there was a consensus as to the possible etiology of this condition. The most likely cause was an involvement of perhaps some developmental error in the sympathetic nervous system supplying the lymphatics of the affected side of the body.

REVIEW OF THE LITERATURE

Edema of the new-born infant, localized to certain portions of the body, is a rare condition. Few cases have been reported; apparently none similar to our case, in which a persistent edema involved the whole side of the body, has been recorded.

Thomas [1] described two cases in adults, wherein the gradual appearance of a complete, unilateral edema followed acute infection of the side of the body involved. The first case occurred in a man, aged 34, with pneumonia and pleurisy of the left side. During the course of the illness edema appeared in the left upper and lower extremities, thorax and scrotum. The second case was in a man, aged 30, with a right hydro-

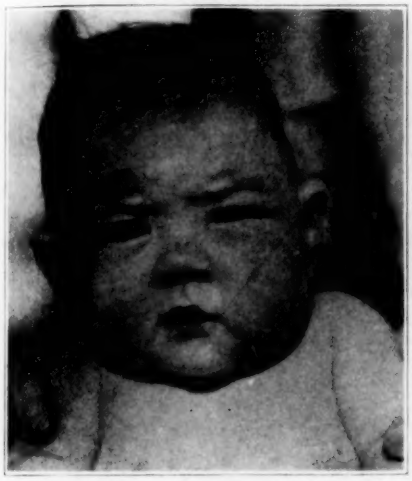

Figure 2

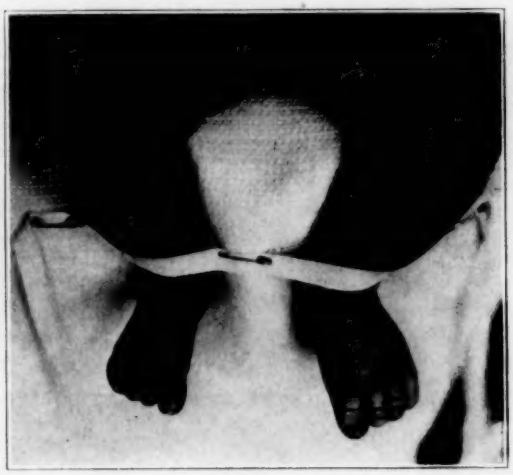

Figure 3

Fig. 2.—Involvement of the left side of the head.

Fig. 3.—Involvement of the left foot, and comparison of the toes with the unaffected side on the right.

pneumothorax. Edema of the right side and front of the face developed and extended to the chest and arm and finally to the lower extremity of that side. The edema began to disappear after sixteen days.

The edema in the cases reported by Thomas is apparently acute and due to a definite infection in the body. The fluid is rapidly absorbed, with convalescence. Thomas explained the mechanism of unilateral edema as due to a reflex stimulation of the peripheral nerves through the pleuropulmonary nerve plexus, which is irritated by the lesions of the organ it innervates. The author expressed the belief that impulses

1. Thomas, Y.: Contribution a l'étude de l'oedème unilatéral, Thesis, Paris, 1911-1912; Ollier-Henry, 1912.

are set up which travel along the routes of the sympathetic nerve of the affected side, causing maximal dilatation of the arterioles of the whole side, elevation of pressure in the capillaries and consequent unilateral edema.

Marcus [2] reported a condition in a girl, aged 18 months, which he described as a congenital lymphangiectatic edema of the left side of the body, including the genitalia and extremities, but not involving the face. The affected extremities were almost twice the size of the corresponding normal parts. The author thought the condition was due to an anomalous maldevelopment of the lymphatic system, resulting in hyperplasia of the subcutaneous tissues with lymph stasis and a consequent elephantiasis.

Von Reuss [3] mentioned this condition and referred to a case of Veit and an analogous case of Fromme, wherein the hands and feet were swollen. Finkelstein [4] described two similar cases: one, a congenital edema of the left arm from the shoulder to the finger-tips, which gradually disappeared during the second year, and another in a child with edema of both upper extremities.

In discussing this condition, Finkelstein stated that congenital, lymphangiectatic edema is recognized by the presence of a swelling which pits on pressure, and which changes in intensity and is influenced by the position of the body. Massaging away an area of edema leaves a section of excessive skin covering. Extensive portions of the body may be involved, or the edema may be localized to an extremity. The condition is apparently due to a congenital dilatation of the lymph spaces, or, as Finkelstein further suggested, a simple, excessive flabbiness of the skin and subcutaneous tissues. In the few cases observed, improvement is gradual and in time may be complete.

Our case differs from the conditions described in several respects. The edema is unilateral and involves the face as well as the extremities.

SUMMARY

A case of unilateral edema in a girl, aged 4 months, has been described. The differential diagnosis has been discussed. It is concluded that the most probable cause is a maldevelopment of the sympathetic nervous system supplying the whole left side of the body. No treatment can be suggested.

This is believed to be the first case of this nature to be reported.

26 East Sixty-Third Street.

119 East Eighty-Fourth Street.

2. Marcus, J. H.: Congenital Lymphangiectatic Edema, Arch. Pediat. **46:** 507 (Aug.) 1929.

3. Von Reuss, A.: Die Krankheiten des Neugebornen, Berlin, Julius Springer, 1914, p. 373.

4. Finkelstein, H.: Lehrbuch der Säuglingskrankheiten, Berlin, Julius Springer, 1921, p. 781.

Progress in Pediatrics

INFANT FEEDING IN ENGLAND AND IN FRANCE FROM 1750 TO 1800*

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There are various reasons for considering the history of infant feeding in the latter half of the eighteenth century. During this period many changes took place in methods of feeding, which finally resulted in something approaching those of modern times. Books on pediatrics, which had previously been scarce and which had contained few details concerning modes of feeding, became more plentiful, and can even now be readily obtained by the private collector. These give detailed accounts of the methods of preparing and of the utensils used in feeding the many different mixtures. A representative collection of these feeding bottles can be obtained from European dealers at a small outlay.

A knowledge of the infant mortality of the period is obtained from the following extract:

> In the year 1767 in consequence of the humane suggestions of Mr. Jonas Hanway, an act of parliament was passed, obliging the parish officers of London and Westminster to send their infant poor to be nursed in the country at proper distances from the town. Before this benevolent measure took place not more than one in 24 of the poor children received into the work houses lived to be a year old; so that out of 2800, the average annual number admitted, 2690 died, whereas since this measure was adopted, only 450 out of the whole number die, and the greatest part of those deaths happen during the 3 weeks that the children are kept in the work-houses.[1]

In London and its suburbs for the period from 1762 to 1771 there were 16,283 births per year; 10,145 children under 5 years of age died and 7,987 under 2 years, a mortality of 62 per cent under 5 years and of 49 per cent under 2 years.[2]

That other factors besides the methods of infant feeding had a share in this huge mortality may be gathered from the following therapeutic measures:

> Powder of earth worms is reckoned a specific for epilepsy. Rubbing of the gums with hare's brain will cure difficult breeding of teeth. Church bugs,

* Submitted for publication, Jan. 24, 1930.
* From the Department of Pediatrics, Harvard Medical School.

1. Hamilton, Alexander: A Treatise on the Management of Female Complaints and of Children in Early Infancy, 1792.

2. Smith, Hugh: Letters to Married Women on Nursing and the Management of Children, 1792.

drowned in white wine, is good for asthmas, jaundice, dropsy, gravel and most chronic distempers.[3]

In 1750 the standard English pediatric text was "De Morbis Acutis Infantum," by Walter Harris, of which two English translations had appeared in 1742. After considering the preexisting causes of the diseases of infants, Harris placed the immediate causes as: (1) cold, (2) thick milk, (3) allowing the infants to eat flesh too early and (4) allowing them to sip wine and other spiritous liquors as soon as they were born.

Too thick milk is due to several causes, firstly indulgence of nurses in wine and spiritous liquors, secondly due to the untimely embraces of women giving suck the menses are provoked, hence the milk stagnates, grows sower and unwholesome and its pabulum is dried up. Finally due to the nurses hysterick disposition or too tender and delicate habit of body the milk degenerates from its just consistence and sooner or later is rendered too thick. Doubtless to these and other causes it is chiefly owing that in the villages about London the passing bell hardly ever ceases ringing out the deaths of infants who have died for the neglect, nastiness, barbarity or intemperance of their nurses.

It is much to be lamented that so many ladies of quality as well as others of inferior rank should expose their tender offspring so cruelly and inhumanly to such imminent dangers from mercenary nurses. The advantages obtained are only that they enjoy diversions more freely, have more time to dress, receive and pay visits, attend public shews and spend the night at their beloved cards.

Harris did not believe in keeping the infant solely on a milk diet.

From some kind of active ferment in their stomachs their appetite is so voracious, I had almost said insatiable, that liquids alone are not sufficient to satisfy it. It must either be blunted with some oily substance such as butter, which acts by besmearing the upper orifice of the stomach, or the child must be nourished with panado, hasty pudding or the like which stay a considerable time in the stomach. And I have sometimes seen children in a languishing way from no other cause than their nurses feeding them with too slim and slender a diet.

M. Brouzet, physician-in-ordinary to the King of France, in his "Essai sur l'education médicinale des enfants," in 1754, gave the French views regarding infant feeding at the beginning of the period. He recognized feeding by the mother, by a wet nurse, with animal's milk and with pap.

The inconveniences which follow the use of milk are fairly well-known. Beside the necessity which one finds of mixing it with other foods on account of its insufficiency, it produces dangerous maladies when it coagulates in the stomach. It is very often altered by the excesses and passions of nurses who communicate to the infants whom they feed their evils and their vicious inclinations. These disadvantages ought to persuade us to give the preference to the milk of animals who are usually more healthy than the nurses and who are not subject as they are to the excesses and passions contrary to the good-

3. Cooke, John: A Plain Account of the Diseases Incident to Children, 1769.

ness of the milk. One ought not to prefer the mother's milk to that of the nurse without having taken into account the state of the mother's health, the number of pregnancies and whether she lives in the city or country.

But since methods of infant feeding involving the use of milk, either woman's or animal's, were often dangerous, he asked if it would not be wise to use pap made from bread lightly boiled in beer or wine, with meal or sugar added, and reduced to a mucilaginous consistency. This was to be diluted with a sufficient quantity of water when one wished to use it as a drink. This pap was a mixture that had been recommended by Van Helmont.

However, Brouzet was careful of his private patients: "Yet in spite of the evidence of the reasons which combat the usage of milk in feeding infants and which constitute the advantages of this pap," he believed that experience was necessary, so he advocated that the pap be tried out on the foundlings. Only after careful experiments, repeated several times, proved its absolute efficiency and its advantages over milk should one decide in its favor.

Van Swieten, first physician to the Queen of Hungary, in his commentary on the aphorisms of Boerhave, published in France, in 1759, took issue with Brouzet and argued as follows:

> It is true that the milk sours, that it coagulates and becomes acid in the stomach and it is this which has persuaded certain people that milk is not the best food which it is possible to give to the new-born. But if one supposes that the infants' digestive organs are incapable of digesting milk which has already been elaborated and prepared in the mother's body, how they flatter themselves that these same organs can subdue and change the other sorts of foods which are certainly further removed from the character of healthy humours than milk.
>
> Van Helmont has condemned the use of milk and has given a long detail of the accidents which it can occasion. That it is a species of nourishment which is common with the beasts seems to have diminished its value in his eyes to the point that he gives, in preference to milk, pap made with beer. Yet this bizarre paradox of Van Helmont which condemns equally all varieties of milk, woman's as well as that of animals, has not found many adherents. With reason, all sensible men always laugh at the vain promises of the chemists. Other celebrated physicians, whose knowledge I respect, have not thought as unfavorably of milk, but they prefer to human milk that of animals. They argue that mothers in olden times communicated to their children the seed of all their virtues, due to the innocence of the times, while in our time of corruption they suck the vice with the milk. In consequence they give the view that mothers should be prevented, by public authority, from nursing their own infants. While waiting for this good law, they counsel the physicians to exhort on this subject so necessary to the public welfare.

Van Swieten went on to prove that earlier periods were not free from vice.

> The infancy of the world was already fouled by a parricide and 5 centuries after the creation the crimes were so great that God destroyed all the people of the world under a deluge.

Again those who wish to proscribe woman's milk because of the passage of the vices of the body and spirit of the mother ought they not to fear for their infants the stupidity of the donkey, also the lustfulness and the petulence of the goat when they give for nourishment the milk of these animals. If one alleges in favor of the milk of beasts the cures which it has brought about in very difficult cases, we reply that woman's milk has made yet more marvelous ones.

Wiliam Buchan, in his "Advice to Mothers," Philadephia, 1804, "that so valuable a fragment may not be lost," quoted the greater part of William Cadogan's "Essay upon Nursing," from the tenth edition of July, 1769. Cadogan stated that if his directions for infant feeding were carried out, "there would be no fear of offending the husband's ears with the noise of the squalling brat." He imputed almost all infants' diseases to overfeeding, overclothing and improper feeding and clothing. His directions for infant feeding are exceeding sane and much in advance of most of those written in his time. "Infants should be put to the breast 6 or 7 hours after birth. They should not be crammed as soon as born with a dab of butter and sugar, a little oil, panada, caudle or some such unwholesome mess." He mentioned the custom of some who give to the new-born infant a little roast pig to cure it of all the mother's longings.

With very few exceptions every child should suck its own mother. No child should be fed with any ungenial alien diet whatever at least for the first 3 months. It is generally supposed that whenever a child cries, it wants victuals; and accordingly it is fed 10, 12 or more times in a day and night. . . . Four times in 24 hours will be often enough to give it suck; letting it have as much as it will suck out of both breasts at each time. Twice a day, and not oftener, a sucking child should be fed at first, once with a thin light broth with a little bread or rice boiled in it and once with a little toasted bread and water boiled almost dry and then mixed with fresh milk not boiled. They should not be stuffed till they spew, as the common method is. Their meals and in my opinion their sucking too, ought to be stated times and the same every day; that the stomach may have intervals to digest, and the appetite return. After 12 months they may be weaned, not all at once, but by insensible degrees. From that time they may be fed only 3 times a day.

The reason for the high mortality of the period and the means for remedying it was given by Alphonse LeRoy in "Medicine maternelle," published in Paris in 1803:

There is in milk, beside the different nutritious principles, an invisible element, the element of life itself, a fugitive gas which is so volatile that it escapes as soon as the milk is in contact with air. This is why it is impossible to rear infants with animal's milk or with milk which has been expressed from the woman's breast. In the country, where the cows have plenty of green pasturage, there is a larger amount of this life in the milk and if it is fed to the infant while it is still warm sufficient remains so that it is possible to raise the infant on that milk.

In 1775 the administrators of the hospital in Aix consulted the faculty of medicine of Paris regarding the means to be taken to con-

serve their foundlings, all of whom were dying at 4½ months of age. LeRoy was appointed by the faculty to inquire into the matter. His report was that the deaths of these artificially fed infants was due to the lack of this vital principle in the milk:

> I counselled the nourishment of these infants at the udder of the goat. While this milk is not as good as woman's milk yet it is better than the milk of the same woman after its withdrawal from the breast. We should give living milk. Since that time the cribs are arranged in a large room in 2 ranks. Each goat which comes to feed enters bleating and goes to hunt the infant which has been given to it, pushes back the covering with its horns and straddles the crib to give suck to the infant. Since that time they have raised very large numbers in that hospital.

George Armstrong, M.D., in "An Account of the Diseases Most Incident to Children," London, 1771, made only a lukewarm appeal for the use of woman's milk. He did not advise the bringing up of infants "by hand" when they could be properly suckled:

> However some mothers are wanting in health, in vigor of constitution; there are some whose nipples are too small, or perhaps ill formed; some whose situation in life will not let them perform this duty. There are some infants who will not take the breast. It is better for an infant to be brought up by hand than sucked by an ailing nurse or one that has not a sufficient supply of breast milk. The least surprise may have a bad effect on the milk of a nervous nurse. The nurse's illness may make it necessary to wean the child suddenly which may be very dangerous. Finally it is very difficult to procure a good wet nurse.

He preferred feeding with a boat or spoon rather than with a horn:

> The horn is a small polished cow's horn to hold a gill and a half. The small end is perforated and has a notch around it to which are fastened 2 small bits of parchment shaped like the finger of a glove and sewed together in such a way that the food poured into the horn can be sucked through between the stitches. The food which the child sucks through this artificial nipple must be thin and no food of the thinness of woman's milk with the same nourishing power has yet been discovered.

Pap boats were made from silver or pewter. Two of the common types in pewter are shown in figure 1. Their capacity was about 2½ ounces. In addition to the ordinary spoon, a special pap spoon, as shown in the same illustration, was also used. In the mint state these were slit across the tip, and the user could enlarge this opening to the desired size by cutting away the soft pewter with a knife. After the spoon was filled, the cover was closed; by blowing down the hollow handle, the feeding period was greatly shortened. A pewter feeding bottle of this period is also shown. This held about 8 ounces, and the top could be unscrewed for purposes of filling and cleaning.

Armstrong attempted to feed two of his own children with the horn, but had to change to a thicker pap fed with the boat.

As a supplementary feeding to breast milk the best is crumb of new baked roll boiled in water to the consistence of what is commonly called pap. This pap should be sweetened with sugar but should not be made sweeter than new milk. If the infant is to be bred up by hand from the birth it should have new cows' milk mixed with its victuals as often as possible and now and then some of it alone to drink. Asses' milk will be still better. While they are very young no regular feeding times can be fixed.

Fig. 1.—Pewter pap boats, feeding bottle and pap spoon.

During this period, four poems of book length on the care of infants were published. "Infancy," by Hugh Downman, M.D., first appeared in three separate books, published in 1774, 1775 and 1776. This was an exceedingly popular treatise, seven editions being published before Downman's death in 1809. His views on infant feeding were as follows:

The infant should be put to the breast within the first twelve hours after birth on account of the laxative action of the new milk. Maternal nursing was advisable. This rendered new conception less likely and gave the mother time to regain her strength. Wetnurses, though

apparently healthy, might convey disease through their milk. If a wetnurse was necessary, she should be of middle age and should live in the country. Her mode of life should be thoroughly investigated. "Heeds she the laws of matron-like sobriety? No sot? No tattling gossip or vexatious scold? Does no suspicion light upon her frame?" She should not be removed to the city; it is wiser for the mother to migrate to the country where she could superintend the nursing.

William Buchan, in "Domestic Medicine," 1776, gave a modern view in the chapter, "Of the Food of Children":

> Nature not only points out the food proper for an infant but actually prepares it. This however is not sufficient to prevent some who think themselves wiser than nature from trying to bring up their children without her provision. The mother's milk or that of a healthy nurse is unquestionably the best food for an infant. Neither art nor nature can provide a proper substitute for it.

By the order of the Swedish Royal Academy of Sciences, the writings on the diseases of children by Rosen von Rosenstein, first physician to the king of Sweden, which had been printed gradually in the Swedish almanacs, were gathered together in one work. This was translated into English, French and German. The following directions for the feeding of infants are taken from the English edition, that of 1776:

> If we cannot procure any nurse, and the mother cannot suckle her child, then we must accustom the child to suck by means of a little instrument, or sucking bottle (called Biberon), which is universally used in Easter-Bothnia with great advantages; but this machine ought always to be kept clean; it is to be made of horn, the smaller end of which may be fastened to a tanned skin of a cow's teat, or if that is not to be procured, we may use any other thin skin pierced with many small holes. Pour in this as much cows and goats cream (unboiled) as you think the child will use at once, dilute it with water, and sweeten it with a little sugar. Afterwards we may give it milk (unboiled) which should be diluted with barley water, provided the child has any slight fever. If the child is disposed to obstipations, mix the milk with a little thin oatmeal-gruel filtrated, in which dissolve a little clarified honey; meal pap is never to be given to any child, it is too gluey, tenacious and slimy a food.

The regimen of the wetnurse is treated fully:

> She should have a large and airy chamber free from any draught of air. It ought to be often swept clean and neat, in order to avoid any bad smell, as also to prevent the nurse and child from getting the itch. Except when it cannot be avoided she ought always to cover her breasts very well, since if the child sucks from the cold breast it will get the catarrh at the nose and cough. Small beer may be drank at pleasure, but should be neither sour, new, or stale. Wine, brandy, ale or coffee ought by no means to be given her; tea she may drink with milk but seldom; the vessel out of which she drinks ought every day to be cleaned. Molasses mixed with the nurse's milk has been known to occasion a great flux to the child. She ought not to eat anything sour, or seasoned with onions or garlic; but if she eats any pease, turneps, or cabbage, the child will generally be troubled with wind.

M. Saucerotte, in "Préjuges et usages abusifs concernant les enfants en bas age," Nancy, 1777, devoted a chapter to the abuses of pap. "Its use leads to rickets and scrofula. Though infants fed on it appear fat and well their embonpoint is fictitious."

He had the following objections to wetnurses: The milk might be old with regard to the lactation period, and there were a great number of bad effects from old milk. Milk transmitted physical and moral vices. The milk of the peasant was too thick and too heavy for the feeble digestive organs of the city child, and the same unfavorable results might arise that followed the use of pap.

The first edition of "A Treatment on the Diseases of Children," by Michael Underwood, M.D., appeared in 1784 and was translated into French in 1786. This was the accepted pediatric text for sixty-two years, the tenth edition appearing in 1846. In infant feeding, Underwood favors the views of Hugh Smith and makes many attacks on Armstrong. He strongly advises the use of woman's milk.

> Every infant should be nursed by its own mother, when not contraindicated by reasons of health. Reason, natural instinct and experience all tend to approve this opinion. In 99% of cases the mother's milk will agree with the child. It is really inconceivable that the usage of filling the infants with bread should be so universal. Womans milk is more fluid than animals milk and at the same time is more nourishing than bread. The milk is the product of all the food taken by the mother, a white blood. In a strong infant not satisfied by the mother's milk at the end of the first month one ought to give in addition a little bread pap 2 or 3 times daily. Milk is the most proper food for the infant raised by hand.

He recommended cow's milk fed from Hugh Smith's feeding pot.

> Either at the moment of birth or some weeks after to render the cow's milk more nutritious one ought to add some calves-foot jelly. One ought to add a little sugar to the mixture if the infant is not subject to gas but the less given the better. When one starts to give milk it should be boiled since boiled milk is less relaxing but when the infant is several months old or if it is too constipated it is sufficient to warm it.

He advised that the first addition to the milk diet be mutton or beef broth free from fat in which had been ground up and softened a little bread. One should offer this once daily, and if necessary give a little bread and milk morning and evening. When the infant had a couple of teeth, one might give him a crust of bread, which was useful for dentition and increased the flow of saliva. A drop of red wine favored the digestion, prevented the disposition to worms, fortified the constitution and, to a certain extent, prevented rickets.

In a small book of 142 pages, "The Means of Feeding Infants by Hand Instead of by Nurses," translated into French from the Italian

by M. Baldini in 1786, the author, while strongly recommending maternal nursing, devoted thirty-two pages to

> . . . the dangerous consequences which result from the nursing of infants by wet nurses. These nurses are for the infants the cause of diseases of which they take the principle with the milk. The infants develop the vices of the wet nurses, they become extremely inclined to wine. The infants become infected with skin and venereal diseases and have been known to develop scurvy and stone through having sucked the bad milk. Numerous celebrated physicians have made the observation that more infants perish through the abuse of wet nurses than through all other causes. Of the infants abandoned to the wet nurses at least two-thirds perish, while of those raised by the mothers less than one-quarter die.

When through fever or other cause the mother is unable to nurse the infant, Baldini recommended animal's milk. Animals were less susceptible to outside sources, and he ruled out the passage of their

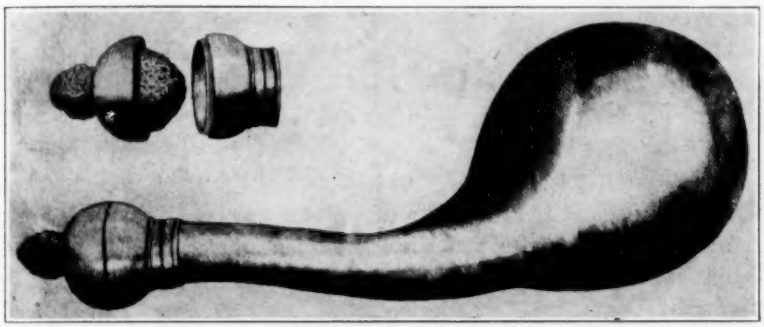

Fig. 2.—Baldini's feeding bottle, 1786.

emotions and habits to the child. "The animals have a more exquisite sentiment than ours, steadier and more healthy. Cow's, goat's or asses' milk may be used. The best cow is a black one with firm solid flesh, bright eyes and a swift step. Goat's milk is more nourishing and detergent than the others; asses' milk is the least nourishing." The feeding bottle recommended is shown in figure 2. It was made of crystal or glass, with a mouthpiece of gilded metal. The globe on the end was filled with a piece of fine sponge, the projecting tip of which was presented to the infant. According to Baldini, the feeding bottle and sponge should be washed several times a day with lukewarm water. The animal should be milked three or four times a day, and the milk should be kept lukewarm and protected from the air. It should be heated before feeding. At first it should be diluted with water, especially when cow's milk was used. The strength was increased to whole milk, as this was well borne. During the first month, the infants were to be fed 1 ounce every two hours during the day, and if they woke

at night, 1½ ounces during the second month and 2 ounces during the third. As they grew, one should increase the amount and lengthen the interval. Feeding of milk should be continued until the age of about 1½ years, when one should begin to add bread to the milk.

"Letters to Married Women on Nursing and the Management of Children," by Hugh Smith, M.D., the sixth English edition of which appeared in 1792, is a book in "the familiar style of letter-writing" from one of the earlier editions of which Underwood drew much of his material. Smith was strongly in favor of maternal nursing, but if it was necessary to take the child from the mother's breast, he preferred feeding with cow's milk to wet nursing.

"There are at present obstinately received opinions against mothers nursing their own infants. Milk is not only the most natural but the best and most strengthening nourishment that infants can receive. Custom, pride and indolence tend to make mothers turn their children over to foster parents." He pointed out the unfavorable effects on the mother's health which might result from repelling the milk. Fevers, tumors and cancers of the breast, asthmatic complaints and lingering diseases or, too commonly, the immediate death of the mother follow from such ill management.

His objections to feeding by wetnurses are the transmission of disease, the lack of the cleansing first milk, and the fact that the wetnurse may become pregnant, in which case the nursling is apt to pine away and die. "Should they escape they are too generally miserable beings suffering from diseases of the glands, rickets, watery gripes and other maladies."

He agreed that the same ill effects might follow the common method of dry nursing, the feeding of pap. His comments on pap feeding gave interesting details of its composition and feeding. "Pap is usually made from only bread and water. Perhaps some will allow a little milk to be mixed with this food but very sparingly because they imagine it stuffs the stomach and fills the child full of phlegm." At his suggestion that 1 pint of cow's milk in twenty four hours was sufficient to feed the new-born infant:

> "Horrors!" cry the ladies when the infant would take 2 quarts of pap and still cry for more. . . . Surely it is wrong to put a large boat full of pap into their little mouths suffering them to swallow the whole of it in the space of a minute and then from their cries to ply them with another which is no sooner down than it is thrown up again. . . .
>
> Cow's milk is the best artificial food. If too rich, which is never the case in the city, and he is far from allowing it in the country, it can be skimmed or boiled and the scum removed. It should be fed unboiled unless it purges the child, in which case boiling will generally relieve the condition. There is no objection to mixing a small amount of sugar with it, especially if the child

is costive. If necessary before the breast milk is established, one should give a little warm milk and water with a small quantity of sugar.

At first the amount fed should be 1 pint a day. The majority of mothers would consider this too small, but Smith did not agree that a

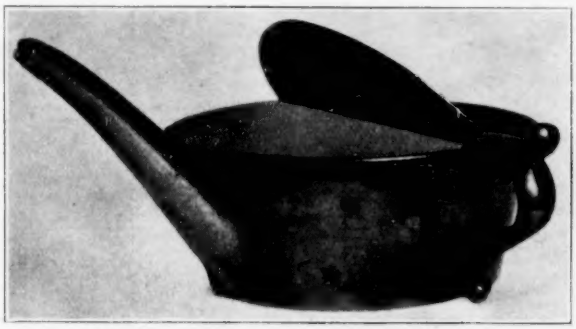

Fig. 3.—Pewter feeding pot, about 1790.

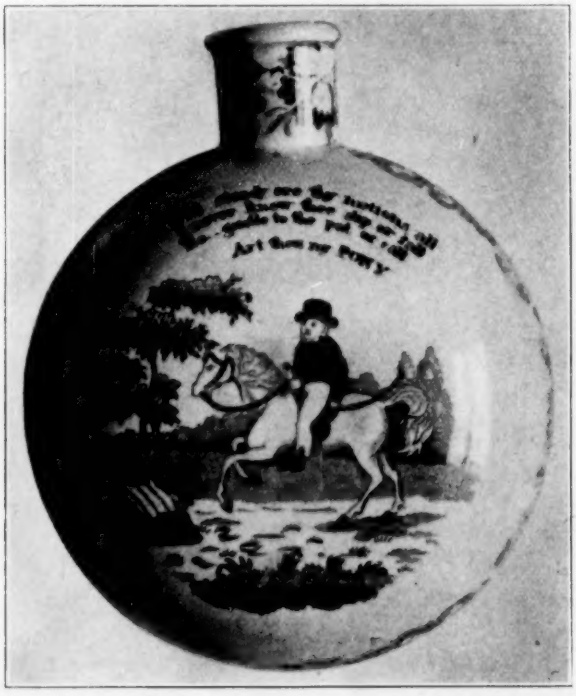

Fig. 4.—Staffordshire pottery feeding bottle, about 1790.

continual puking was natural and wholesome. At 30 days of age, 1½ pints were to be fed in twenty-four hours, and at 3 months, 2 pints. He did not advise more than 3 pints. At the end of three months, he frequently ordered milk and broth to be mixed together.

His description of the milk-pot which he contrived for his own nursery and which found great favor with Michael Underwood is as follows:

This pot is somewhat in form like an urn; it contains a little more than a quarter of a pint; its handle, and neck and spout are not unlike those of a coffee-

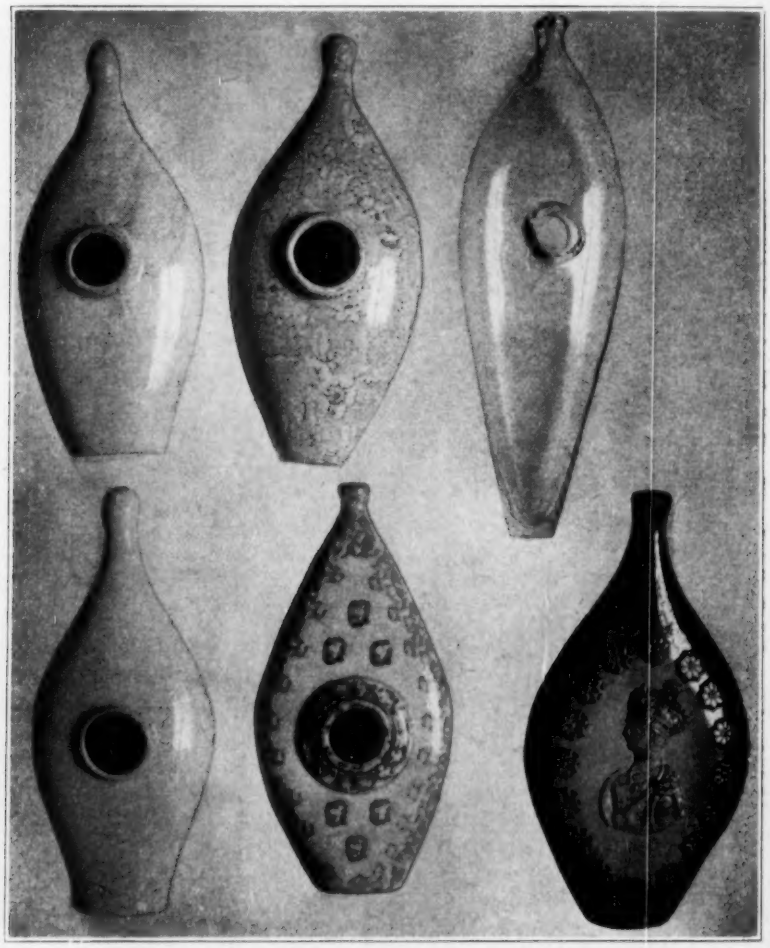

Fig. 5.—Pottery and glass feeding bottles, nineteenth century.

pot, except that the neck of this arises from the very bottom of the pot, and is very small. The end of the spout is a little raised, and forms a roundish knob somewhat in appearance like a small heart; this is perforated by three or four small holes; a piece of fine rag is tied loosely over it, which serves the child to play with instead of the nipple, and through which, by the infants sucking, the milk is constantly strained. The nurses confess it is more convenient than a boat. The model of this milk-pot is left with Mr. Morrison, at the Three Kings, in Cheapside, for the benefit of the public.

I have been unable to procure a specimen of Smith's feeding pot, but in figure 3 is shown a pewter feeding pot of this period and of somewhat the same design. The Staffordshire pottery bottle shown in figure 4 is of the same period.

This brings us to the beginning of the nineteenth century. Maternal nursing was recognized by all writers as the best method of nourishing infants. There was still much discussion as to whether infants who could not be nursed by the mother should be confided to the wet-nurses or whether they should be fed cow's milk mixtures. All writers were doing their best to depopularize the almost universal use of pap as the sole manner of bringing infants up by hand. A different type of feeding bottle made its appearance and was decorated according to the pattern used on china at the period of its manufacture (fig. 5). By the middle of the reign of Victoria, while still retaining the original form they were made from glass. From this type developed the glass bottle with the long sucking tube which many can remember.

DISEASES OF THE EAR IN CHILDHOOD*

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DISEASES OF THE EAR AND AGE OF PATIENT

Each period of life—childhood, middle age and old age—has its own peculiar type of ear trouble. With few exceptions, the person who has passed the age of 50 has a greater or lesser defect in the upper tone ranges, the result of degeneration of the cochlear nerve. Such defects involve primarily the upper tone range and therefore interfere but little with the hearing of the voice; only exceptionally do they progress so far as to constitute a serious handicap.

During middle life there is a different form of ear trouble, usually beginning in early adult life. Like the process which involves the eighth nerve in old age, this disease of the ear which occurs during adult life is produced by changes that are permanent. The alterations are primarily not of the nerve, but are such as to produce fixation or rigidity in the apparatus for the conduction of sound waves from the outer air to the nerve of hearing in the labyrinth. This form of ear trouble is the one that is responsible for most of the cases of severe deafness that handicaps so many people during middle life. The difficulty usually becomes manifest toward the end of the second decade. It is unusual to find it developing during the first decade and almost as rare to find it beginning after the age of 40. This progressive ear trouble of adult life is in no sense a hold-over from ear troubles that develop during childhood, although the fact that a person has suffered from ear trouble in childhood does not render him immune from developing otosclerosis in adult life.

During childhood, say during the first decade, the ear is menaced in a manner different from that in which it is menaced in either old age or middle life. Progressive deafness produced by an insidious degeneration of the eighth nerve, as encountered in old age, is not met with in children; and progressive deafness, the result of fixation of the conducting mechanism encountered so often in middle life, practically never occurs in childhood. However, during this first decade the ears are more seriously menaced than during any other period in life. There

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are several reasons for this. In the first place, it seems proper to include congenital deafness as occurring during this period. Congenital deafness is the result of developmental anomalies which involve the cochlea. From an extensive survey of children in the public schools for the deaf, carried out under the auspices of the National Research Council, my co-workers and I found that of a total of 5,348 children examined 3,334 (that is, considerably more than one-half) were afflicted with congenital deafness. Of this number, there were 1,374 (or approximately one-third) in whom heredity and consanguinity were etiologic factors. Developmental anomalies may also involve the outer ear, producing a closure of the external meatus, but the two processes, that involving the cochlea and that affecting the outer ear, are rarely combined in the same person. The process which involves the cochlea produces deaf-mutism. When the developmental anomaly involves the outer ear, even when the external meatus is closed in both ears, the defect in hearing is not marked.

A congenital defect producing total deafness often leaves the vestibular mechanism intact, whereas acquired total deafness usually carries with it a destruction of this mechanism.

CAUSES OF EAR TROUBLE IN CHILDREN

The pediatrician has a much greater interest in diseases of the ear than has the internist, for the obvious reason that the ears of children are much more frequently affected than are those of adults. There are two outstanding reasons for the greater frequency of acquired diseases of the ear in children: (1) the occurrence in childhood of the infectious fevers and (2) the greater frequency of acute infections involving the respiratory tract with the harmful sequelae involving the middle ear and dependent frequently on the presence of adenoids and enlarged tonsils. From the study of the children in the public institutions for the deaf, it was found that deafness was acquired in 2,014 of the 5,348 children examined, and that the infectious fevers played an important part in the production of these acquired defects. Meningitis heads the list, and next in frequency is measles; scarlet fever and influenza follow in about the same proportions, and in addition there is a long list of other acute infections, including infantile paralysis, mumps and pneumonia.

It is of interest to note that the serious defects in hearing resulting from the infectious fevers, such as scarlet fever and measles, are not dependent to any extent on the occurrence of otitis media; rather, they are the result of a toxic neuritis which develops independent of any infection of the middle ear. The popular impression, at least among otologists, has been that the serious injuries to the hearing occurring in connection with infectious fevers has primarily been dependent on

a suppurative otitis media to which has been added a secondary involvement of the labyrinth. In the children who were examined, there were 139 deafened as the result of scarlet fever, and of these only 57 had suffered from otitis media; whereas in 81 who had not had any involvement of the middle ear deafness developed as the result of a toxic neuritis. In the same way, 172 children were found to be deafened as the result of measles, and of this number only 50 had had otitis media, whereas 121 were deaf because of the toxic neuritis which again developed independent of a disease of the middle ear.

The reason that the pediatrician is especially interested in diseases of the ear is perhaps not so much the severe deafness that occurs congenitally or as a result of infectious fevers, but the much more frequent otitis media which often menaces the life of the child rather than produces any serious defect in hearing. The tubotympanic processes constitute the type of ear trouble which is the peculiar liability of childhood, and the frequency with which these processes occur in childhood is dependent on the prevalence during this period of acute infections of the respiratory tract associated with enlargement of the pharyngeal tonsil. What are these tubotympanic processes? How seriously do they menace the hearing, and how seriously do they menace the health or life of the patient?

The tubotympanic processes vary from that producing an occlusion of the eustachian tube (in children usually the result of an adenoid mass in the vault of the pharynx) to the suppurative processes involving the middle ear, the acute and the chronic.

As regards the question of the menace which these processes carry with them for the hearing, I should say that they all depress the hearing function more or less. Those processes that produce simply a tubal occlusion, a common disease in childhood, cause only a moderate depression of the hearing. This depression usually subsides spontaneously during the summer months when the child is free from acute involvement of the respiratory tract, and finally disappears permanently, usually during the second decade. A thickened, retracted drum membrane is all that persists to indicate the tubal condition through which the child has passed. An important point that needs emphasis is that this form of ear trouble so frequently found in childhood does not predispose the patient in any sense to the development of progressive deafness, which constitutes so serious a menace to hearing in adult life. Occasionally the tubal occlusion does produce a permanent, rather serious, form of deafness; but this occurs only occasionally. The menace from the other type of tubotympanic disease, namely, suppurative otitis media, is one more to the health or even the life of the patient than to the hearing function.

ANATOMIC CONSIDERATIONS INFLUENCING DISEASE OF THE EAR IN CHILDREN

If one would have a full appreciation of the clinical problems of suppurative otitis media in early childhood, one must first of all keep clearly in mind the anatomic differences between the temporal bone of a child and that of an adult. In the first place, a new-born child has no bony external meatus. The membranous canal is attached directly to the rim of bone, the os tympanum, to which the membrana tympani is also attached. In the second place, there is no mastoid process and no mastoid cells. The antrum from which the mastoid cells later develop is the only air space in this region back of the ear. This is, in reality, part of the tympanic cavity, with which it connects by means of a large, flaring passage. In the third place, the sutures that unite the several parts which make up the temporal bone are still patulent in the young child. The petrosquamosal suture passes directly through the outer wall of the antrum and also through the upper wall of the tympanum, which separates the middle ear from the middle fossa.

The bearing which these anatomic conditions have on the clinical problems of otitis media is obvious. The attachment of the membranous canal, for example, to the os tympanum renders the manipulation of the auricle in the young child painful when otitis media occurs; whereas, after the formation of the bony meatus, such manipulations cause no discomfort.

The absence of pneumatization of the mastoid process excludes the possibility of a development of mastoiditis as understood in adults.

In the young child there can be no development of a focus of infection in the depths of the process obscure from detection because of a thick bony covering, as in adults. The presence of a patulent petrosquamosal suture passing directly through the outer wall of the antrum (the only pneumatic cell back of the auricle) renders the clinical significance of a swelling back of the ear occurring at the onset of otitis media the same as that which is attached to the bulging of a drum membrane, and not at all of the same importance as when this condition develops in adults.

In the young child, a reaction of this sort will usually subside promptly after the drum membrane has been perforated. In cases in which a subperiosteal abscess develops back of the ear, a simple incision draining the abscess is usually sufficient, except, of course, when the exposure of the bone discloses an area of softening which may require, at most, the removal of the softened bone by means of a curet.

The petrosquamosal suture passing through the tegmen permits of the extension of infection from the middle ear to the middle brain fossa much more readily in a young child than in an adult. Like the exten-

sion of the reaction from the middle ear to the periosteum over the mastoid region, this extension to the middle fossa may have no serious clinical significance. Symptoms of a manifest meningitis occurring during the early stages of otitis media will often disappear as promptly as does the swelling back of the ear, simply by establishing drainage through the drum membrane.

A correct evaluation of the clinical phenomena associated with otitis media in children requires an appreciation of these anatomic facts. There are other factors equally important which must be considered in this condition in children; for example, the higher temperature which is prone to develop in the child. Since there is no mastoid process in an infant and no mastoid cells in a young child which could conceal in the depths a dangerous focus of infection, one is permitted to be more tolerant of a persisting elevation of temperature than one might dare to be in an older person with a fully developed mastoid process.

I would not leave the impression that I minimize the menace that exists in otitis media, particularly in young children; but I would emphasize that when there is free drainage from the middle ear through a perforation in the drum membrane, and when there exists no palpable alteration in the soft structures back of the ear, I do not see that anything is done to remove the menace of a possible intracranial complication by making an opening back of the auricle.

Otitis media in young infants has been the subject of careful study by otologists for many years, and the clinical phenomena have long been recognized. The fact remains, however, that otitis media in an infant frequently passes unrecognized, largely perhaps because of the difficulty of securing a proper inspection of the drum membrane. I have held that it is a safe rule to follow that when an infant has some infection, and when the examination of the drum membrane leaves one in doubt as to the presence of otitis media, the proper procedure is to incise the drum membrane.

MASTOIDITIS IN INFANTS

The question of making an opening back of the ear under these conditions presents itself. I am not much impressed with the reasons advanced for such a procedure. In the first place, one should keep in mind that the whole of the middle ear in the infant is but one chamber, which includes the tympanic cavity and the antrum. When the opening is made in the drum membrane, and this cavity is drained, no occasion exists for also making a counter-opening back of the ear, unless there happens to be a softening of the bone covering the antrum. This softening becomes manifest at once by clinical evidences of periostitis. In every case of acute otitis media in an infant in which an opening is made back of the ear, pus should be found in the antrum, which, as I

have said, is part of the tympanic cavity. The reports that softened bone is often found at these operations when no indication of periostitis exists have not impressed me. When an actual condition of softened bone exists, there is, I believe, ample evidence of this process in the surface alterations. Some enthusiasts have ventured so far as to report recovery from the systemic condition following operation back of the ear, when no clinical evidence of otitis media had been discovered. The longer one practices medicine, the less one is inclined to be impressed by the report of recovery after operations when palpable indications for the operation were absent. Because patients recover after some unnecessary operation is no argument that the recovery is the result of the operation. The recovery in these cases occurs in spite of the operation, rather than because of it.

Pediatric Biographies

ROBERT WHYTT

1714-1766

JOHN RUHRÄH, M.D.
BALTIMORE

Robert Whytt deserves a high place in the history of pediatrics, for he it was who placed tuberculous meningitis on a firm clinical basis. He was born in Scotland in 1714, received his A.M. degree at the age of 16 and then entered the medical school in Edinburgh, a medical school which had in that year been recognized as such by the Senatus Academicus. Most of the three or four years of his medical student life in Edinburgh were spent in the study of anatomy under Monro. In 1734, he went to London to study under Cheselden and later to Paris, where he attended clinics at La Charité and Hôtel Dieu. Later, he heard Boerhaave, then quite an old man, in Leyden. In April, 1736, he received his M.D. degree in Rheims. It is highly probable that his Scotch thrift led him to go to a smaller French town for his degree. One of the diarists of the period stated that "Doctor's degree at Leyden costs sixteen pounds besides feasting of the Faculty; at Angers not above nine pounds and feasting not necessary neither."

The following year, St. Andrews conferred the degree of doctor of medicine, and he was admitted a licentiate and a year later as a member of the Royal College of Physicians of Edinburgh. He was then 24, and at the age of 34 he was made professor of the theory of medicine. In 1752, he was elected a fellow of the Royal Society of London. In 1761, the post of physician to the King of Scotland was created, it is said especially for Whytt. In 1763, he was elected president of the Royal College of Physicians of Edinburgh, which position he held until his death.

He wrote considerable, and after his death his writings were collected and edited by his son with the assistance of Sir John Pringle. Like most physicians and scientific men of his day he corresponded with congenial spirits scattered over the world. The flood of medical journals in the present day and the use of numerous time-saving (sic!) devices preclude such pleasant interchange of ideas and perhaps render it superfluous. From Dr. John Lining he heard about the yellow

fever epidemic in Charleston, S. C., and from Dr. Alexander Garden he learned something of American botany.

He wielded a facile pen, and some of his numerous contributions were translated into French, Norwegian and German. Whytt was a philosopher and a physiologist as well as a physician, and his work "On the Vital and Other Involuntary Motions of Animals" found widespread recognition. This work contained an early, perhaps the earliest, clear account of reflex action, especially spinal reflexes.

His fame as a clinician rests on his remarkable monograph, "Observations on the Dropsy of the Brain," published in 1768, the full title of which reads:

OBSERVATIONS
ON THE
DROPSY in the BRAIN
BY
ROBERT WHYTT, M.D.
Late PHYSICIAN to his MAJESTY,
President of the Royal College of Physicians, Professor of Medicine
in the University of Edinburgh, and F.R.S.

TO WHICH ARE ADDED
His other TREATISES never hitherto published
by themselves.

EDINBURGH:
Printed for JOHN BALFOUR,
By BALFOUR, Auld & SMELLIE
M,DCC,LXVIII.

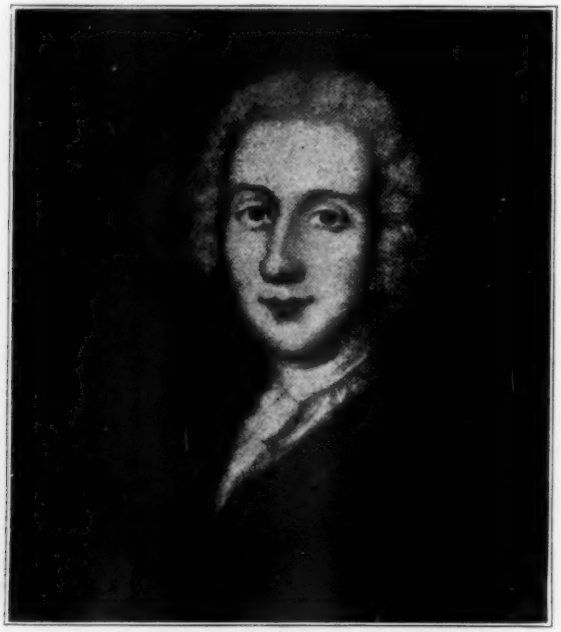
OBSERVATIONS
ON THE
Most frequent Species of HYDROCEPHALUS INTERNUS,
VIZ,
The DROPSY of the VENTRICLES
of the BRAIN.

Dropsy of the brain was no new subject when Whytt tackled it, and left a milestone in the history of the disease as a result. It is a small work, and he reports his observations in only twenty cases, but he managed to see and describe every clinical feature of importance known

today which could be determined with the means at his disposal. All that has been added since has been accomplished by special methods of scientific research.

He divided the disease into the well known three stages according to the pulse rate. The first stage when it is rapid, the second when it is slow and the third or terminal stage when it again becomes rapid.

But let him tell his own story. These are only excerpts of his description of the three stages.



ROBERT WHYTT

1714-1766

AN ACCOUNT OF THE SYMPTOMS IN THE DROPSY OF THE VENTRICLES OF THE BRAIN

First Stage

Children who have water in the ventricles of the brain begin to have many of the following symptoms, four, five, or six weeks, and in some cases much longer, before their death.

At first they lose their appetite and spirits; they look pale, and fall away in flesh; they have always a quick pulse, and some degree of fever. In some cases I have seen a hydrocephalus attended with a considerable degree of fever, which had frequent remissions, but without any order or regularity: In other cases the paroxysms came on pretty regularly in the evening, and then the disease was

taken for a slow irregular nervous fever, or for one occasioned by worms. At this time, in children of five years and upwards, I have found the pulse at a hundred and ten, in others at a hundred and twenty, and in a few cases at a hundred and thirty, or even at a hundred and forty strokes in a minute; but rarely ever so full as to indicate bleeding.

In others the quickness of the pulse and heat of the skin were not so considerable; but I do not remember to have seen any patient who had not some degree of fever in this, which I call the first stage of the disease.

While the feverishness continues or increases, they lose their appetite more and more; their tongue is often white, sometimes it is remarkably clean, and towards the end of the disease acquires an aphthous redness. They are thirsty, and frequently vomit once or twice in a day, or once in two days. They complain of a pain in the crown of their head, or in the forehead above their eyes. They are commonly costive, tho' sometimes they have returns of a looseness. When bound, they are not easily moved by a purge; sometimes they are troubled with gripes. Their spirits being low, they incline mostly to lie in bed, altho' they are often more disposed to watching than to sleep. They cannot easily bear the light, and complain when a candle is brought before their eyes. They are observed to pick their nose, and in their sleep to grind with their teeth, as in the case of worms.

* * * * * * *

Symptoms of the Second Stage

I date the beginning of the second stage from the time the pulse, from being quick but regular, becomes slow and irregular. This sometimes happens about three weeks, often a fortnight or less, before the death of the patient.

In this stage the pulse is commonly not only much slower than it was before, but often more so than in health. In a girl of thirteen, the pulse, which for a fortnight beat above a hundred times in a minute, about nine days before she died, fell to eighty-four, next day to seventy, and the day after to sixty, becoming always more irregular the slower it was. In a youth of sixteen the pulse, which for several weeks had been feverish, on the fifteenth day before his death, beat only sixty-eight in a minute: two days after, it fell under sixty, and once to fifty.

* * * * * * *

In this distemper it is observable, that when the pulse is nearly as slow, or slower than natural, it is always irregular or unequal, both as to the strength and the interval of the strokes. When it grows quicker, the irregularity lessens; and when it becomes very quick, it is then most equal and regular. Farther, it deserves notice, that, altho' in the second stage the pulse becomes much slower than it was before, the heat of the skin continues much the same, and sometimes seems rather to increase.

I have insisted the longer on the state of the pulse in this period, as from thence we can learn the surest *diagnostic*.

During the second stage, most of the symptoms mentioned in the first continue. The sick are then unable to sit up, tho' generally they sleep little, till towards the end of this period, when they begin to grow drowsy. They moan heavily, yet cannot tell what ails them. Their eyes are often turned towards their nose, or they squint outwards, and sometimes they complain of seeing objects double. Some, towards the end of this stage, grow delirious, and cry out in a wild manner, as if they were much frightened: About this time also, or later, they frequently void either real worms, or some substance like worms in a dis-

solved state; yet this discharge gives no relief to the patient, and only helps to deceive the less experienced practitioner with regard to the nature of the disease.

The urine in this, as well as in the other stages, varies; it has often a large sediment, sometimes none at all; but most commonly it deposites one of a slight consistence and a white colour. In several I have observed the urine have a large furfuraceous sediment, till within a few days of their death, when it had no separation.

The breath has now, but especially in the last stage, such a sickish and offensive smell, as I do not remember to have observed in any other distemper. During the second as well as the first stage, the patients are often, for some days, or parts of days, much easier than at other times.

Symptoms of the Third Stage

When the pulse (which for some time was nearly as slow or slower than in a healthful state) rises again to a feverish quickness, and becomes regular, the third and last stage may be said to begin.

This change in the pulse is observed five, six, or seven days before death. In two patients only the pulse did not become more frequent till two days before they died; and in two others it began to grow quicker nine or ten days before that event.

As the time of this change in the pulse is different in different patients, so is the degree of its quickness. In some it rises gradually from below seventy, eigthy, or ninety in a minute, to a hundred and twenty, a hundred and forty, a hundred and seventy, and sometimes above two hundred, before they expire. In others the pulse gets up more suddenly, in one day perhaps from a hundred to a hundred and fifty. In the last stage, after the pulse grows quicker, it does not keep constantly to the same measure, but will be often a good deal slower for part of a day and quicker all the rest. The pulse beats generally faster on the day they die than at any other time before. In one of those whom I attended, it beat above two hundred and ten times in a minute. I never knew any go off in this disease whose pulse did not rise to near a hundred and thirty strokes in that time.

In the third stage, the patient, who before was little disposed to sleep, becomes then drowsy and comatose. When roused, he utters only a few incoherent words, and appears to be insensible. The beginning of the *coma* is uncertain; it is often about the end of the second stage before the pulse grows quicker for the second time; but in a few cases I have known this quickness of the pulse come on before the patients become comatose.

Frequently one eye-lid loses its motion, and afterwards the other becomes also paralytic. About this time, or rather sooner, the pupil of one or both eyes ceases to contract, and remains dilated in the greatest light. But the time of this symptom varies much: in some it happens five, six, or seven days, in others only two or three days, before they die. Three or four days before the death of a boy of five years old, I was surprised to find the pupils, which had been much dilated before, no larger than natural. At first I flattered myself, that the distemper had taken some favourable turn; but was soon undeceived; for, upon giving the child a spoonful of weak cinamon water, with some drops of *spiritus volatilis oleosus*, the pupils became as wide as they had been the day before. In less than half an hour after, they contracted again; but immediately dilated upon holding some spirit of *sal. ammoniacus* to his nose. I have since observed the same interchanges in the pupils of a boy four years old, on the third day before he died. In this case the pupils not only were enlarged, by giving him a spoonful of wine,

or holding volatile spirits to his nose, but also by so small a *stimulus* as my lifting up his eye-lids, which had lost all their motion, and had fallen so far down as to cover near the half of the eye. Before they are seized with the *coma*, they sometimes complain of seeing strange and frightful objects. A day or two before death, the *tunica conjunctiva* of one or both eyes frequently becomes inflamed; but they generally continue to hear for some days after they are blind.

In this stage, the patients are sometimes observed to be constantly raising one of their hands to their head; and are generally troubled with convulsions of the muscles of the arms, legs, or face, as well as with a *subsultus tendium*. In a girl of thirteen, the day before she died, the hands were strongly bent inwards by a fixed spasm of their muscles. A youth of sixteen, who when in health had been liable to spasms, about the end of the second stage began to be affected once or twice a-day with cramp in one of his arms, which ascended to his throat, and often prevented his speaking for some minutes. One of the cheeks will twice or thrice in a day grow hot and red, while the other, with the lips, remains pale and cold. These flushings generally appear two, three or four days before death. In a boy of five years old, one side of both his arms became frequently red, while the other side never changed its colour. After death, the arms and breasts have been seen of a deep purple colour.

I had one patient who, four days before he died, bled once and again at the nose.

Those who have been costive before, often become loose in the third stage, and complain of gripes. A day or two before death, the patient either swallows with difficulty, or not at all. Lastly, the respiration grows more frequent and laborious; and in some there is a considerable pause after every expiration. This kind of breathing I have also observed in those who have died of an apoplexy, arising from a suppression of urine.

Upon opening the heads of ten of those patients from whom I have collected the symptoms above mentioned, I found in all of them a clear thin fluid in the anterior ventricles of the brain, immediately below the *corpus callosum*. There was frequently the same kind of liquor in the third and fourth ventricles; but whether this is always the case, I cannot say, as I had not attended sufficiently to this circumstance. I never met with water between the *dura mater* and the brain, between the hemispheres of the brain, or immediately above the *corpus callosum*. Altho' there seems to be a communication between the two anterior ventricles; yet, in two cases, I found one of them much distended, while the other contained but little water.

The quantity of water contained in the ventricles of the brain was generally from two ounces to five; but I have been told of one case in which it amounted to near eight ounces. This fluid does not coagulate with heat, like the *serum* of the blood, or the lymph that is found in the *pericardium*, or what is taken from the abdomen by tapping in a dropsy; and this difference seems to be owing to the exhaling arteries of the brain being much smaller than those of the other parts.

Correspondence

FERRY ANTIMEASLES SERUM

To the Editor:—In the February, 1930, issue of the AMERICAN JOURNAL OF DISEASES OF CHILDREN, volume 39, page 294, Dr. M. G. Peterman in his paper, "Antimeasles Diplococcus Serum (Tunnicliff)," takes me to task for my conclusions with regard to the Ferry antimeasles serum. He quotes from a brief paragraph of my paper in the *Journal of the American Medical Association* in which, in passing, I referred to the tests with this type of serum but indicated that a separate report would be published later. That later report appeared in the AMERICAN JOURNAL OF DISEASES OF CHILDREN in May, 1929, volume 37, page 963, and was entitled "Animal Serum in Measles: Results with Ferry and with Degkwitz Serum." Dr. Peterman's reference gives the title of a paper of mine on modified toxin which appeared in the same issue as the paper on measles. Perhaps that was merely a lapsus scribendi.

It is difficult, however, to understand how, after reading the paper on measles, he could say that my conclusion was based on the results in only four children who were given Ferry serum, one of whom came down with the first symptoms the same day and one four days later. It is plain in the paper (p. 966), even in the absence of a summary, that fourteen children were given the Ferry serum. He further states, "the dosage used was not mentioned." If he will turn to the paper, he will find the dosage of the goat serum mentioned on page 966 and the horse serum dosage on the next page. He appears to make a good deal of the point that in one child the disease developed on the day the injection was given, without realizing that in the discussion definite allowance was made for this. It was brought in to indicate that in tests of this sort in children's institutions, where the history of previous disease or previous exposure cannot always be accurately ascertained, fallacious conclusions might be drawn.

In addition to the use of the serum in fourteen cases, eight controls were observed and a number of tests were made with the serum both for the possibility of blanching the rash and for the Debré phenomenon, which is analogous to the rash extinction test in scarlet fever, and which may be comparable to it in determining the potency of a serum. Nevertheless, I felt it necessary to be cautious about drawing conclusions. Evidently the reviewer who abstracted my paper for the *Zentralblatt für die gesamte Kinderheilkunde* (**23**:449 [Aug. 27] 1929) realized this, for he says, "Während er sich beim Ferryschen Serum zurückhaltend ausspricht, sah er vom Degkwitzschem keinerlei Günstiges" (while he is reserved in his verdict on Ferry's serum, he did not see any favorable results from Degkwitz' serum).

The control of measles will probably have to wait for the development of a potent animal serum or some artificial means of active immunization which could be produced in any needed quantity. Although there are *a priori* reasons against the acceptance of a streptococcus as the etiologic organism of measles, one should be willing to test out animal serums that might be found useful. The tests, however, should be tried under carefully controlled conditions. I hope in the next epidemic of measles in Syracuse, which is expected in 1931, to have an opportunity further to test animal antimeasles serum, and to run double control groups, one without any serum and the other with convalescent serum of proved potency.

A. CLEMENT SILVERMAN, M.D.

To the Editor:—In answer to the letter of Dr. A. Clement Silverman, I shall refer first to the article published in the *Journal of the American Medical Association* (**91**:1786 [Dec. 8] 1928). On page 1791 appears the following:

"Ferry's and Degkwitz's serums were tried out in children over 4 in a measles outbreak in children's institutions, and a few private patients were also treated when convalescent serum would ordinarily not be used.

"In the first tests with Ferry's serum, one child came down with the first symptoms of the disease the day the serum was given and another child showed the symptoms four days later. None of the other treated patients or the controls became sick. The child who came down with measles four days after the serum had been given did not appear to have the disease modified. Two children, given the serum three and five days, respectively, after exposure, came down with severe measles. Intracutaneous tests with 1 cc. of serum twenty-four hours before the appearance of the exanthem failed to cause local inhibition of the rash (phenomenon of Debré).

"The Degkwitz serum was given to fourteen children on the first rise in temperature to 100 F. or more about nine days after exposure. All came down with measles, as was expected, except that in three the fever disappeared after the first rise and the first symptoms of measles did not supervene until from three to six days afterward, when the temperature again went up. The disease in these treated patients did not differ from that in the controls, when the symptoms and the duration and height of fever were compared. In addition, two of the treated patients developed severe serum reactions and two developed bronchopneumonia as a complication. Of forty untreated patients in the institution only one had a mild bronchopneumonia.

"In my experience, therefore, neither the Degkwitz nor the Ferry serum showed any evidence of value in measles."

My chief objection was to the conclusion in this article, in which it is obvious that Ferry's serum was not given early enough and in which the dosage is not mentioned.

In Dr. Silverman's second article (Am. J. Dis. Child. **37**:963 [May] 1929) the results of the injection of the Ferry goat and horse antimeasles serum are given. Nine children in institutions received injections; five children seemed to have been given injections by various other physicians. In the first group (page 966), the disease developed in only one of the seven children who received injections, and this developed four days after the injection. Three of the controls developed measles. In the next group (page 966, second paragraph), of two children given Ferry's goat serum one developed measles on the same day. On page 967 reference is made to five children who received streptococcus antimeasles serum (Ferry). These children, under observation by various physicians, all developed measles following injection. One might question the date of exposure in the first child who developed measles six days after injection.

On this evidence Dr. Silverman concludes: "From the foregoing results, it is obvious that my experience with the Ferry serum does not show any definite evidence of its value."

Unfortunately, in my article there is some confusion in the reference numbers, which I regret. In footnote 8 the reference is to Dr. Silverman's article which immediately preceded the one on "Animal Serum in Measles" in the same issue.

M. G. Peterman, M.D.

News and Comment

Second International Pediatric Congress, Stockholm, Aug. 18-21, 1930 (Third Announcement).—The Congress Bureau undertakes to engage rooms for members of the congress in hotels, boarding-houses and, if desired, private families. Rooms will be available to members at the most favorable prices. Rooms in hotels will range in price from 7 or 8 to 14 or 15 kronor for single rooms, and from 12 or 13 to 25 kronor for double rooms. If a private bathroom is desired, the price will be higher by about 50 per cent. In private families single rooms will be from 5 to 7 kronor, and double rooms from 10 to 11 kronor. Breakfast and service are not included in any of these prices.

Those members who wish to avail themselves of the Congress Bureau in obtaining rooms should obtain an application form to be filled in and returned before June 30, 1930. Special wishes, e. g., for a room in the same hotel with some other person, should be indicated. If rooms are ordered for other members, the names and addresses of these members should be specified.

All communications are to be addressed to *The Second International Pediatric Congress, Stockholm, Sweden;* telegram address, *Pediatric, Stockholm.* For the avoidance of errors, it is absolutely necessary that all names and addresses be written with printed characters or typewritten.

Stockholm, March, 1930.

I. JUNDELL, M.D.,
Chairman, Swedish Organization Committee.
NILS MALMBERG, M.D.,
Secretary, Swedish Organization Committee.

Dr. Lokrantz Decorated by Sweden.—Dr. Sven R. Lokrantz, medical director, Los Angeles city schools, recently was decorated by the King of Sweden for "his health work for the children of California and in a lesser degree for the children of Sweden."

DEATHS

Dr. James D. Love, a well known pediatrician of Jacksonville, Fla., died of pneumonia on March 27 after a short illness.

UNIVERSITY NEWS

Harvard Medical School is offering postgraduate work in pediatrics as follows: Course *A*, one month (June): fee $125.00 all day; $80.00 mornings only; $60.00 afternoons only; $80.00 with lectures and pathologic conferences. Course *B*, from October to May inclusive, number limited: fee $6.00. Registration fee for each course is $5.00.

Dr. Maynard Ladd, Harvard University Medical School Courses for Graduates, Boston, is in charge of this work.

Abstracts from Current Literature

Anatomy and Physiology

EMBRYONAL AND POSTEMBRYONAL DEVELOPMENT OF THE HUMAN CEREBRAL CORTEX. I. N. FILIMONOFF, J. f. Psychol. u. Neurol. **39**:323, 1929.

In the sixth month of fetal life, the cortex in the region of the area striata shows distinct stratification. The area striata is easily distinguished from the area occipitalis because the latter is considerably less stratified. The areas in the region of the fissura centralis are still less stratified. Even at this age there is a greater cell density in the gyrus centralis posterior than in the gyrus centralis anterior, and the differentiated cells (the future Betz cells) can already be made out in the gyrus centralis anterior.

In the seventh month of fetal life, all areas examined were distinctly stratified and many showed peculiarities in stratification that could be regarded as characteristic for certain individual areas. The area striata is already divided into its ten layers (I, II, III, IV a, IV bα, IV bβ, IV c, V, VI, VII) is rich in cells, and has a wide IV layer but a narrower III layer; its VI layer is dense and dark, and in marked contrast to the VII layer. The area occipitalis is characterized at this stage by intense stratification of its upper (II, III and IV) layers and relatively poorer stratification of the lower (VI and VII) layers. The area gigantopyramidalis is characterized by the extensive width of its cortex, the transition of its layers into one another, a relatively narrow IV layer, and a wide V layer with its characteristic subdivisions into V a r, Vγ and V b r. In this stage, the area postcentralis tenuigranularis is already characterized by its relatively wide III and relatively narrow IV layer. The area postcentralis supragranularis is characterized by its intense cell density, slight differentiation of the upper layers (II, III, IV) and unusually well differentiated lower layers, which are separated from the former by a pale V layer. Finally, the area postcentralis eumacropyramidalis shows a typical seven layer stratification which is exceptionally well marked in the upper, as well as in the lower, layers.

At this age, as well as later, the area striata shows by far the most characteristic stratification. Changes in stratification after the seventh month of fetal life occur chiefly in layer II. First, it merges gradually into layer III, and second, it becomes narrower at the expense of the latter. In the adult, the III layer is developed not only at its own expense but also at the expense of the tectogenic ground layer of the II layer. At birth, the narrowing of the II layer reaches its full and definite degree of development. Beyond this, the alterations in stratification are insignificant. An exception to this rule is observed only in the area gigantopyramidalis. Layer IV, which is already well indicated at the end of fetal life in this area, disappears completely first in the process of postembryonal development. For a long period after birth there is found between III^3 and V a r, a band which on structural grounds cannot be designated as a genuine IV layer, because it consists to a considerable degree of well differentiated cells which, owing to the dense distribution of the latter, can readily be distinguished from its adjacent layers. This remnant of the IV zone is designated as (IV)—the parenthesis indicating not only its origin (its separateness from III and V) but also its nongranular character.

Whereas the differentiation of the layers, with the exception of the IV layer of the area gigantopyramidalis, is practically complete at birth, cell differentiation to any considerable extent does not begin to take place till the postembryonal period. The differentiation of the various kinds of cells of the cerebral cortex occurs during different periods. In this respect, the large cells of the V layer far exceed all remaining cells. In all the areas examined by the author, these cells were already well developed in the seventh, and in the area gigantopyramidalis

in the sixth month of fetal life, i. e., at an age when the remaining cellular elements still have their neuroblastic character, the former are already well formed and of relatively large size, though not so large as in the adult. The remaining cells are first differentiated later, but even in these the differentiation is already in full progress at birth. In this connection, it must, however, be emphasized that during this process of differentiation the development of the size of the cells is relatively independent of the time at which the development begins. This is best illustrated in the area postcentralis supragranularis. In this area, in the adult, the large cells are only rarely found in the V layer, and during the process of embryonal development their size and number are not so great as those of the corresponding cells of the other areas. Here one is dealing apparently with a postembryonal arrest of development.

It must also be pointed out that there is no reason to speak of this phenomenon as an arrest of development in the strict sense of the word. These cells are merely retarded in their growth. Whereas during an early period of development these cells may be regarded as large cells, in the adult brain, unless they keep on growing further, they must be regarded as small cells.

The tempo of differentiation and development of the cells, both of which are rapid during embryonal and postembryonal development, rapidly becomes slow during further postembryonal development, so that in a child aged 3 cell differentiation has reached a high degree, and in a child aged 8 the cells of the cerebral cortex differ little from those of an adult.

The differentiation of the various kinds of cells of the cerebral cortex assumes different characteristics for each type of cell. The cells of the II and III layer go through the early stage of pyramidization: a wide triangular cell with a large nucleus so situated that the protoplasm of the cell is visible only in the margins of the triangle. The spindle cells never go through this stage; they always assume the shape of a bipolar cell. The cells of the IV layer and the star-shaped cells of layer IV b in the area striata show early in their differentiation a perinuclear arrangement of protoplasm in which the nucleus is surrounded on all sides by a more or less uniform deposit of protoplasm.

These are, in the main, the general characteristics of embryonal and postembryonal development of the areas examined. The author states that present methods of investigation and especially methods of brain fixation do not permit more detailed conclusions.

KESCHNER, New York.

Pathology, Bacteriology and Biochemistry

FLUORESCENCE OF SOME VITAMIN A-CONTAINING FATS. RONALD S. MORGAN and KENNETH MACLENNAN, Biochem. J. **22**:1514, 1928.

When a beam of light from a quartz mercury vapor lamp, completely enclosed so that the only light emitted has to pass through a filter that cuts out nearly the whole of the visible portion of the spectrum, is allowed to fall on any object in a darkened room, a characteristic fluorescence is observed. A method has been devised by which the actual brightness of the fluorescence of a solid fat, illuminated by ultraviolet light (filtered free from visible light), may be determined and the color expressed in terms of three additive primaries: red, green and blue. Butter and margarine show dissimilar fluorescence; the former shows a fairly bright yellow color, whereas margarine is blue. This difference cannot be accounted for by a difference in vitamin content.

KUGELMASS, New York.

THE INFLUENCE OF ULTRA-VIOLET RADIATIONS ON THE BLOOD SUGAR OF THE RABBIT. F. G. HALL and R. W. ROOT, J. Elisha Mitchell Scient. Soc. **43**:187 (July) 1928.

Rabbits irradiated with mercury quartz lights show a decided increase in blood sugar concentration. Radiations from the same lamp that are filtered through

glass raise the blood sugar concentration less than do the unfiltered rays. The development of resistance to the effects of light is indicated by a lessened response after several exposures.

KUGELMASS, New York.

THE EFFECT OF EXTRACTS OF ORGANS ON THE INFECTING POWER OF VACCINE VIRUS. F. DURAN-REYNALS, J. Exper. Med. **50**:327, 1929.

Brain and testicle tissue from immune rabbits brought in contact with the Levaditi or Noguchi strains of vaccine virus will fix or inactivate the virus. Extracts of normal testicles from susceptible animals enhance to an extraordinary degree the infectivity of both the neuro and the dermal strains of vaccine virus. The Noguchi virus is not affected by testicle extracts when injected into the skin, but kidney extract has a definite enhancing power on the strain when injected into either skin or testicle. The effect of tissue extracts seems to be on the cells of the host rather than on the virus. This is indicated by the fact that virus injected intravenously localizes most readily in an area of skin previously injected with testicle extract. Furthermore, an enhanced lesion results if the virus is injected into an area as long as three days after the area has been injected with testicle extract. The augmenting substance of the tissue extracts is little affected by high dilutions, passes through a Berkefeld V candle and is carried down with the proteins precipitated by weak acids. Rabbits with enhanced lesions show general symptoms and about 25 per cent die with generalized vaccinia. Kidney, and probably skin, brain and liver extracts possess enhancing properties, but to a much less degree than the testicle. On the other hand, spleen, blood and probably lymph nodes and bone-marrow not only fail to produce enhancement, but actually restrain or even suppress entirely the vaccinal skin infection.

AUTHOR'S SUMMARY [ARCH. PATH.].

A STUDY OF THE GENERALIZATION OF VACCINE VIRUS FROM ENHANCED SKIN LESIONS. FRED W. STEWART and F. DURAN-REYNALS, J. Exper. Med. **50**: 341, 1929.

Rabbits bearing intensive skin lesions resulting from the intracutaneous injection of neurovirus plus testicular extract show typical histologic alterations in the gonads, suprarenal glands, liver, spleen, lung, lymph nodes and bone-marrow. Similar but less widespread alterations are found after intravenous injection of neurovirus. Although testicle extract injected intracutaneously with neurovirus has a marked enhancing action on the activity of the latter, the same mixture injected intravenously yields no sign of any such enhancement. The significance of these observations as regards the question of the ectodermotropism of vaccine virus is discussed, and the doctrine of specific organ affinities is considered.

AUTHORS' SUMMARY [ARCH. PATH.].

THE ANTIBODY RESPONSE IN THE HUMAN BEING AFTER INJECTION WITH NORMAL HORSE SERUM. LOUIS TUFT and S. G. RAMSDELL, J. Exper. Med. **50**:431, 1929.

After the injection of normal horse serum into the human being, serum sickness occurs even more regularly than in patients treated with the various immune serums, but this is not accompanied by the production, to any notable degree, of circulating antibodies of the various types that are regularly to be demonstrated after the administration of immune serum and its resulting serum sickness. Since normal horse serum therefore appears to be weakly antigenic, and immune serum highly antigenic for the human being, one must assume that this difference is the result of some alteration in its antigenic characteristics produced during the course of the immunization or of its preparation for use; or that the specific antibody which is responsible for the phenomenon of serum sickness has not yet

been identified; or that this phenomenon is not in any way dependent on the presence of the various known antibodies to normal horse serum.

AUTHORS' SUMMARY.

THE STORAGE OF IRON FOLLOWING ITS ORAL AND SUBCUTANEOUS ADMINISTRATION. CYRIL J. POLSON, Quart. J. Med. **23**:77 (Oct.) 1929.

Rabbits were fed daily doses of 0.5 Gm. of iron (a 25 per cent solution of liquor ferri perchloridi B. P.) in their food for periods varying from 172 to 450 days. In other animals, subcutaneous injections of undiluted dialyzed iron (B. D. H. Ltd.) were given. Five animals each received a single injection of from 10 to 20 cc. Three received more than one dose; the total dosages being 40.5, 20 and 11.4 cc., respectively. After intervals of from one to eleven months, the animals were killed and their organs examined.

It was found that the liver is the principal site of iron storage, while small amounts were found in the spleen and the lymphatic glands. The cecum and the kidneys contained an excess of iron and were probably concerned in its excretion. An excess of iron in the bone-marrow was not observed; neither was there undue activity of its cells. The rate of storage in the liver was faster after subcutaneous than after oral administration and a larger amount was present.

BRADFORD, Rochester, N. Y.

THE PATHOGENESIS OF DIABETES. JEAN LA BARRE, Bull. Acad. roy. de méd. de Belgique **8**:758, 1928.

The venous blood from the pancreas of a normal dog is introduced by a pancreatic-jugulary anastomosis into a depancreatized dog; the hyperglycemia in the latter disappears, which proves the presence of insulin in normal blood. Excitation of the right vagus increases the insulin content of the pancreatic blood, which is shown by the hypoglycemia brought about in a depancreatized dog by infusion of this blood. By cross-circulation experiments, using the method of Hymans, the author proved that hyperglycemia stimulates the nerve center that regulates the secretion of insulin.

KUGELMASS, New York.

BLOOD CHOLESTEROL IN THE CHILD. E. LESNÉ, P. ZIZINE and SYLVESTRE, Rev. franç. de pédiat. **5**:423 (Aug.) 1929.

Blood cholesterol was determined in 300 children, several determinations often being made on the same child. Normally the quantity increases gradually from 0.8 Gm. per liter in the infant aged a few months to 1.5 Gm. in the adolescent child. Infants receiving breast milk have a slightly higher content than those on artificial feeding. In acute infections there is a hypocholesteremia followed by an increase, sometimes above normal, during the period of recovery. In chronic infections the cholesterol is normal or slightly elevated. In acute nephritis it is definitely increased, unless the condition becomes grave, when there is a decrease. The hypercholesteremia with disturbances of the liver is considered a passive one. The observations in rickets are inconclusive.

LESLIE, Evanston, Ill.

THE FIXATION OF CALCIUM IN THE CHILD. JEANNE SHOEN, Thèse de Lyon, 1929.

Experience and experiment have shown that the calcium needs of the organism are not necessarily supplied by giving sufficient calcium in the food. Certain other factors are necessary in order that calcium be properly absorbed and retained. The author has made a study of various substances and factors in relation to their ability to fix calcium.

The importance of phosphorus is shown in the production of rickets with sufficient calcium but insufficient phosphorus. Epinephrine, thyroid and parathyroid extracts have no prophylactic action against rickets. The use of cod liver oil and ultraviolet light is the best means of fixing calcium.

The mechanism of fixation is said to be poorly understood; it is a complex biochemical phenomenon in which the carbon dioxide tension, the acid-base equilibrium and the protein content of the blood probably all play a part. Substances that were found to prevent the fixation of calcium were calcium chloride, sodium phosphate and potassium iodide. The decalcifying action of acids, strontium and arsenic was not proved.

LESLIE, Evanston, Ill.

ALTERATIONS IN THE OSSIFICATION OF CARTILAGE OF RATS. C. GIAUME and ADA RANNO, Riv. di clin. pediat. **27**:829 (Nov.) 1929.

Twenty rats, about 30 days of age, were put on "diet 85" and kept in the dark. They were killed after a varying interval, and the histologic changes in the bones were noted as rickets developed. The first changes, histologically, were noted in the cartilaginous cells nearest the bone.

HIGGINS, Boston.

A METHOD FOR CONDUCTING A PROLONGED STUDY OF MINERAL AND NITROGEN METABOLISM IN NURSLINGS. E. ROMINGER, H. FASOLD and H. MEYER, Arch. f. Kinderh. **88**:179 (Aug. 20) 1929.

The authors use a modified Kjeldahl method for the nitrogen estimation, and a rather elaborate but practical modification of the Kjeldahl-Kolben method for the minerals. Sodium, potassium, calcium, magnesium and phosphorus may be determined by this method.

SANFORD, Chicago.

STUDIES IN IODINE CONTENT OF NORMAL AND PATHOLOGIC THYROID GLANDS. G. LUNDE, K. CLOSS and K. WUELFERT, Biochem. Ztschr. **206**:248, 1929.

Following the method of von Fellenberg, the iodine content of many normal and diseased thyroid glands was determined. Normal Norwegian glands have an average weight of 24.66 Gm. and a total iodine content of 9.86 mg. The relative iodine content of these normal thyroids is 43 mg. per hundred grams of fresh, and 155.29 mg. of dried, gland. The iodine content of nodular goiters without hyperthyroidism varies greatly, but is usually much higher than it is generally believed. In the nodular colloid goiter with hyperthyroidism the iodine content was found to be high, from 14.6 to 122.9 mg. per hundred grams of the fresh gland.

The thyroid gland in exophthalmic goiter is poor in iodine and colloid, but it retains both after administration of a compound solution of iodine.

HELLWIG, Wichita, Kan.

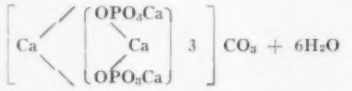
DETERMINATION OF CREATINE AND CREATININE IN SMALL QUANTITIES OF BLOOD. E. KOPLOWITZ, Biochem. Ztschr. **211**:475, 1929.

Serum or laked whole blood is deproteinized with trichloracetic acid and centrifugated. To an aliquot portion of the clear solution a drop of nitrophenol and a few drops of 33 per cent sodium hydroxide are added until a yellow color appears. For the creatine determination the solution (1 cc. of serum, or 0.83 cc. of blood) is treated with enough sixth-normal hydrochloric acid to give a final concentration of second normal, and this is left for twenty-four hours at from 60 to 65 C., when all the creatine is converted to creatinine. The creatinine is determined colorimetrically by adding 5 cc. of a mixture of 25 cc. saturated picric acid with 10 cc. of 3 per cent sodium hydroxide, and matching the color after letting it stand for thirty minutes. No difference was found in the creatine or creatinine content of venous and arterial bloods.

KUGELMASS, New York.

SYNTHETIC PREPARATION OF THE MAIN CONSTITUENT OF BONES AND TEETH. T. GASSMANN, Ztschr. f. physiol. Chem. **178**:62, 1928.

The main constituent of bones and teeth is a phosphatocalcium carbonate of the formula



Synthetically, it may be prepared through the action of sunlight in the presence of natural ice water which contains small amounts of phosphorus in soluble oxide form. The method consisted in covering 1 Gm. of dry calcium oxide from marble with 10 cc. of filtered natural ice water, allowing the mixture to evaporate in sunlight, exposing the residue for three days to atmosphere carbon dioxide, adding 1.5 Gm. of calcium oxide and 3 Gm. of disodium acid sulphate dissolved in 15 cc. of natural ice water, evaporating as before, boiling with distilled water and filtering. After drying at from 110 to 120 C., the residue is heated on the water bath with 15 cc. of glacial acetic acid, evaporated and washed with absolute ethyl alcohol. The CO_2 in the formula may be replaced by Cl_2 by heating with barium chloride, which yields the mineral apatite. The natural and the artificial phosphatocalcium carbonate are apparently identical in composition and properties. A study of its combining power with organic substances should throw some light on calcium metabolism and diseases of the bones.

KUGELMASS, New York.

PHOTOCHEMISTRY OF VITAMIN D. STANISLAW K. KON, Roczniki Chem. **8**:502, 1928.

Repeated boiling of cholesterol solution in acetone with potassium permanganate removes completely the provitamin from cholesterol, which, purified in this way and irradiated, is antirachitically inactive, even in large doses. The photochemical formation of vitamin D under the influence of monochromatic ultraviolet light has been studied quantitatively for different lines. The quantity of radiant energy necessary to form an amount of vitamin D sufficient to cause a demonstrable deposition of calcium in the bones of a rachitic rat has been found to be constant over a wide range of radiations; from 700 to 1,000 ergs are necessary for the *256*, *265*, *280* and *293* micron lines. The quantum efficiency is independent of the state in which ergosterol is irradiated, the results being the same for irradiation of the solid or of solutions in alcohol of varying concentrations. The quantum efficiency was the same for viosterol acetate as that for viosterol. The hydroxyl group plays no rôle in the process of activation. An application of the thermopile to the direct study of photochemical processes is described. It is shown that the formation of vitamin D from ergosterol is in all probability a complicated process with a low quantum efficiency, even when monochromatic ultraviolet light is used.

KUGELMASS, New York.

Nutrition

A STUDY OF THE ROUTINE USE OF POWDERED WHOLE MILK IN INFANT FEEDING. LESLIE O. ASHTON, OLIVER L. STRINGFIELD and CHARLES W. MARTIN, Arch. Pediat. **46**: 75 (Feb.) 1929.

The study was undertaken to determine if powdered whole milk could be used successfully in place of fresh whole milk as a base for modified milk formulas in infant feeding. The literature is reviewed. The beta hemolytic streptococci found in the dried milk employed were shown to be nonpathogenic for human beings.

Analysis of the dried milk showed: fats, 28 per cent; casein, 21.28 per cent; lactalbumin, 5.46 per cent; lactose, 38 per cent; ash, 5.76 per cent, and water, 1.50 per cent.

The average weekly gain of infants under 6 months of age was 6¾ ounces (192.2 Gm.). The average weekly gain of 100 infants over 6 months of age fed on modified powdered whole milk over a period of one year was 4¾ ounces (136.6 Gm.).

The authors conclude that none of the essential elements of milk has been destroyed in the powdered whole milk and that modifications of powdered whole milk can be used routinely in infant feeding instead of fresh whole milk modifications.

WILSON, Norfolk, Va.

A COMPARATIVE STUDY OF CERTIFIED AND PASTEURIZED MILK IN INFANT FEEDING. MILTON SMITH LEWIS, Arch. Pediat. **46**:85 (Feb.) 1929.

From March, 1925, to March, 1927, 234 infants were observed. Group 1, comprising 122 infants, received certified milk, and group 2, comprising 112 infants, received pasteurized milk. These groups were further subdivided into the periods from birth to 3 months, from 3 to 6 months and from 6 to 9 months.

In all age groups, those fed on certified milk made distinctly more progress than those fed on pasteurized milk. This was most marked in the youngest age group, viz., from birth to 6 months of age. Rickets was less noticeable in the group given certified milk and was of a mild type. Sixty cases of diarrhea occurred, twenty-four in group 1 and thirty-six in group 2, with nine and fifteen deaths, respectively. The mortality was 10 per cent for group 1 and 16 per cent for group 2. The bacterial count of the pasteurized milk ranged from 10,000 to 30,000, that of the certified milk, 3,500 and below.

WILSON, Norfolk, Va.

HYGIENIC TREATMENT OF UNDERWEIGHT CHILDREN. O. B. CORDUA, Arch. Pediat. **46**:99 (Feb.) 1929.

Observations were made on the changes in weight of eighteen underweight children treated at a summer health school during a period of eight weeks. A thirty minute rest period in the forenoon and a fifty-five minute rest period in the afternoon were provided, in addition to morning and afternoon lunches. At the beginning of the fifth week, malt extract and cod liver oil were added. The average gain in weight for the entire period was 5.4 pounds (2.4 Kg.). During the second period of four weeks, when maltine with cod liver oil was given, the average gain was 3.4 pounds (1.5 Kg.). The average underweight at the beginning of the school was 11.6 per cent, at the close, 2.5 per cent. The ages were from 5 to 11 years, with an average of 7.4 years. Twelve patients were girls, and six boys.

WILSON, Norfolk, Va.

AN EXPERIMENTAL STUDY OF THE USE OF UNSWEETENED EVAPORATED MILK FOR THE PREPARATION OF INFANT FEEDING FORMULAS. MCKIM MARRIOTT and LUDWIG SCHOENTHAL, Arch. Pediat. **46**:135 (March) 1929.

The characteristics of unsweetened evaporated milk are described. The investigations included observations on 752 infants. These were compared with the results on 670 infants who were breast fed or who were given artificial feedings prepared from bottled milk. Evaporated milk was fed to 570 newly born infants at the St. Louis Maternity Hospital, and the results were compared with those of a control series of 526 newly born infants when breast fed or given formulas prepared from bottled cow's milk. Of those fed evaporated milk exclusively, 92.8 per cent regained the birth weight by the end of fourteen days. Of those whose food consisted chiefly of evaporated milk, 80 per cent regained the birth weight at the end of fourteen days. Of the 526 newly born infants fed exclusively on breast milk or given an extra feeding of formulas prepared from bottled cow's milk, 66 per cent regained the birth weight at the end of fourteen days. Evaporated milk is readily utilized by very young infants, and its feeding leads to no disturbance, as observed in either dispensary or private practice.

Sixty-seven infants in Washington University Dispensary were fed evaporated milk for from six weeks to thirteen months, the average period being 130 days; over two thirds of these infants were started on evaporated milk during the first week of life. The average daily gain in weight was 25.5 Gm. (0.9 ounces); the same rate of gain occurred in a control series. The average weight development at the time when the evaporated milk feedings were begun was 97.2 per cent of the established average for normal breast-fed infants. The average weight development at the end of the period of feeding was 102.7 per cent. In a control series of fifty-five infants the weight was 99.8 per cent at the beginning of the period of observation and 102.7 per cent at the close.

Seventy-five infants in St. Louis Children's Hospital were fed on evaporated milk. In this group the evaporated milk was entirely satisfactory. Eleven premature infants were fed on evaporated milk formulas, and nine exclusively on evaporated milk. The average daily gain in the latter group was 25.8 Gm. (0.92 ounces). They were remarkably free from digestive disturbances and showed little tendency to infections.

WILSON, Norfolk, Va.

CONGENITAL EXTRINSIC DUODENAL OBSTRUCTION AND PYLORIC STENOSIS: DIFFERENTIAL DIAGNOSIS. SIDNEY WOLFGANG, Arch. Pediat. **46**:182 (March) 1929.

The differential diagnosis is recited in detail and a case of each is reported. The treatment in both instances is surgical after a brief tentative treatment with atropine sulphate. The mortality is usually high. The case of pyloric stenosis reported responded well to atropine solution. The patient with extrinsic duodenal obstruction was operated on and died in two weeks.

WILSON, Norfolk, Va.

SHOULD WHOLE WHEAT PRODUCTS DISPLACE THE REFINED PRODUCTS? VICTOR E. LEVINE, Arch. Pediat. **46**:281 (May) 1929.

Removal of the bran and germ in the making of white flour causes loss of protein superior to that of the endosperm. The bran and germ contain the vitamin E, practically all the vitamin B and by far the largest proportion of the inorganic elements; therefore removal of the bran also causes the loss of the vitamin E and B and 75 per cent of the total mineral content.

Wheat loses 62 per cent of its calcium, 76 per cent of its phosphorus and from 70 to 80 per cent of its iron in the refining process. Most of the iodine is also lost. Supplementation of the deficiencies of refined wheat is a nutritional ideal but an economic impracticability. Among people of limited means, the use of whole grain instead of the refined product is far more important than when cereals constitute one quarter or less of the total calories. In families of low means, refined wheat constitutes more than 25 per cent of the total caloric intake and 38 per cent of the total protein intake.

The greatest advantages that would occur to the American people on the adoption of whole wheat would be a beneficial increase in the intake of iron, in undigestible residue and in the intake of water-soluble B and of fat-soluble E.

WILSON, Norfolk, Va.

A STUDY OF THE ANTIRACHITIC VALUE OF IRRADIATED POWDERED WHOLE MILK. ADOLPH G. DE SANCTIS, LESLIE O. ASHTON and OLIVER L. STRINGFIELD, Arch. Pediat. **46**:297 (May) 1929.

The literature is reviewed. The ideal prophylactic for rickets would be a food which in itself contains the necessary substances to prevent rickets. In the winter of 1926-1927, ten infants under the age of 6 months were fed 25 per cent irradiated powdered whole milk; 50 per cent of these infants developed rickets. In the winter of 1927-1928, thirty infants were fed 100 per cent irradiated powdered whole milk. The experiment was conducted from October 1 to April under

careful control. Secondary anemia was not noted. The infants apparently did as well as those on fluid cow's milk mixtures. Twenty-four infants were wholly protected from rickets; five were protected clinically, but roentgenograms showed that there was dietary disturbance in the epiphyses of the long bones. One infant was not protected. To be antirachitic, powdered whole milk should be 100 per cent irradiated.

WILSON, Norfolk, Va.

ALTERATIONS IN THE MECHANICS OF THE GASTROINTESTINAL TRACT AS A CAUSE OF POOR APPETITE IN CHILDREN. JOHN HOWELL WEST, Arch. Pediat. **46:** 318 (May) 1929.

Two types of appetite are considered:

(1) poor appetite associated with constipation and gastro-intestinal atony and (2) poor appetite as result of mechanical alterations in the intestinal tract.

The first type is seen in the overactive, highstrung, underweight and underheight child. He is usually pale; his muscles are soft and flabby, and the bowels are constipated. He eats between meals and has a poor appetite. His diet is deficient in the "protective" foods. The management of such cases is as follows: 1. All tonics, cod liver oil and iron are stopped. Green vegetables, stewed or raw fruits, cereals and meat are emphasized. One pint of milk is allowed every day. Fats and sweets are restricted. The child is fed only at meal-time. 2. Vitamin B in the form of pasteurized brewer's yeast, one-half teaspoonful, is given. 3. The child is sent to the bathroom immediately after breakfast and kept there for fifteen minutes. An afternoon nap of one and a half hours is required. He is put to bed at 7 p. m. 4. Aromatic fluid extract of cascara sagrada is given after each meal if the bowels do not move at least once each day.

The second type of poor appetite is that associated with the various ptoses and angulations of the intestinal tube. A complete gastro-intestinal study is made. These children are the victims of poor appetite, recurrent vomiting, fever and constipation. There is usually marked lordosis with enlarged abdomen. These are managed as follows: 1. An abdominal belt is applied. 2. Aromatic cascara is given in sufficient amount to produce at least two movements daily. An enema is given if necessary. 3. A "smooth" diet without the coarse food is given. 4. The sinusoidal current is employed in the large pendulous abdominal type with relaxed muscles. 5. A rigid anal sphincter is treated to relieve the constipation of the sigmoid and rectum.

WILSON, Norfolk, Va.

CONGENITAL ATRESIA OF THE BILE DUCTS. L. ROSENBERG and G. E. JUDD, Arch. Surg. **18:**2339, 1929.

A lengthy review is made of the case of an infant aged 3 months, on whom congenital atresia of the bile ducts was demonstrated, and in whom the liver showed a diffuse biliary cirrhosis. A review of the literature is given and a differential diagnosis made. The authors point out particularly that the cirrhosis of the liver is present at birth, and is as much a part of the disease as the atresia of the extrahepatic ducts. The spleen was enlarged in this case, and the authors believe that it was due to hyperplasia of the endothelial system.

ENZER, Milwaukee.

"HYPERVITAMINOSIS" AND "VITAMIN BALANCE." LESLIE J. HARRIS and THOMAS MOORE, Biochem. J. **22:**1461, 1928.

Viosterol, cod liver oil and cod liver oil concentrate are all harmful in excess, the degree of toxicity being proportional to the quantity of vitamin D present. Crystalline ergosterol, overirradiated ergosterol and ergosterol resinized by heating are harmless when consumed for the same periods, at lethal levels in the case of irradiated ergosterol. Rats receiving the normal allowance of yeast concentrate (B vitamins) suffered from no marked symptoms of vitamin B deficiency when

viosterol was given at a rate 1,000 times the minimal physiologic dose. Normal gestation always failed in rats receiving a diet containing 15 per cent cod liver oil.

KUGELMASS, New York.

ANTIRACHITIC FACTOR IN BURBOT-LIVER OIL. BERTHA CLOW and ABBY MARLATT, Indust. Engin. Chem. **21**:281, 1929.

Burbot, a fresh water relative of the cod, is abundant in the Great Lakes and in the streams near them. The antirachitic potency of oil from burbot liver was estimated by studies on the healing of rachitic rats in ten days as determined by Steenbock's method. The test showed 2 per cent cod liver oil equal to 0.125 per cent burbot liver oil, or 0.06 per cent cod liver oil equal to 0.007 per cent burbot liver oil. Since different samples of cod liver oil vary much in effectiveness, the superiority shown by the burbot liver oil in this one test may be misleading.

KUGELMASS, New York.

ANTINEURITIC AND WATER-SOLUBLE B VITAMINS IN BEEF AND PORK. RALPH HOAGLAND, J. Agric. Research **38**:431 (April 15) 1929.

Lean pork is an excellent source of the antineuritic vitamin, comparing favorably in this respect with brewer's yeast. Beef contains much less of the antineuritic vitamin than pork. Lean pork is also a good source of water-soluble vitamin B, but it does not contain so much of these vitamins as does either brewer's or baker's yeast. No material difference was observed between fresh and smoked hams as sources of either the antineuritic vitamin or the water-soluble vitamin. Lean beef contains much less water-soluble vitamin B than lean pork.

KUGELMASS, New York.

IS IRRADIATED FARINA AS BOUGHT IN THE MARKET ENRICHED WITH VITAMIN D? F. W. SCHLUTZ and MILDRED R. ZIEGLER, J. A. M. A. **93**:1466 (Nov. 9) 1929.

These investigators found that irradiated farina as purchased in the open market and added as 10 per cent of a rachitic diet does not cure rickets in rats.

BONAR, Salt Lake City.

CEREALS AND RICKETS. HARRY STEENBOCK, B. RUSING, A. BLACK and B. THOMAS, J. A. M. A. **93**:1868 (Dec. 14) 1929.

Various cereal products, such as whole wheat meal, patent white flour, shredded wheat biscuits, cream of wheat, whole corn meal, corn flakes, hominy and rolled oats, were made antirachitically active by irradiation with ultraviolet rays. This activity was found stable to autoclaving and to storage for sixteen months. In the latter instance, after from twenty-three to twenty-eight months there was a decreased potency. Household cooking does not affect the activity. By the feeding of commercially irradiated rolled oats, rickets was prevented in dogs and rats, and no interference in growth or reproduction occurred over fifteen months in four generations.

BONAR, Salt Lake City.

SODIUM AND POTASSIUM BALANCES WHEN USED AS CITRATES IN ACIDOTIC AND RACHITIC CONDITIONS IN RATS. J. H. SPEER, V. V. COLE and F. W. HEYL, J. Am. Pharm. A. **18**:225 (March) 1929.

Rats were kept on diets sufficiently deficient to produce acidosis. One lot of rats was fed sodium citrate and the other half a mixture of sodium and potassium citrates, the total alkalinity being the same for each lot. Calcium lactate was added to each. Sodium and calcium do not conserve potassium; sodium and

calcium favor calcium retention. Sodium, potassium and calcium favor retention of potassium and also of calcium, although too much potassium with low sodium is less favorable to retention of calcium. No difference was found in phosphorus retention whether calcium, potassium and sodium were added or only calcium and sodium. Most favorable results were obtained when all three elements, calcium, sodium and potassium, were added. The proportions of sodium to potassium should be about 5.9 : 1.

KUGELMASS, New York.

THE EFFECT OF AVITAMINOSIS ON HEMATOPOIETIC FUNCTION. B. SURE, M. C. KIK and D. J. WALKER, J. Biol. Chem. **83**:375, 387 and 401, 1929.

There is no relation between vitamin A deficiency and pernicious anemia. Deficiency of either vitamin A or vitamin B may be reflected in a slight initial anemia, followed by a later increase in the red cell count, which is occasioned by the associated anhydremia. Vitamin E appears to be without effect on the hematopoietic function.

ARTHUR LOCKE.

NUTRITIVE VALUE OF MILK: I. PRODUCTION OF NUTRITIONAL ANEMIA IN ALBINO RATS THROUGH EXCLUSIVE WHOLE MILK DIETS. W. E. KRAUSS, J. Diary Sc. **12**:74, 1929.

An exclusive whole milk diet fed to weaning rats from normal females produces severe anemia in from four to six weeks. The preventive or curative power of different substances can be determined by supplementing the milk diet with them. Substances that gave the best results in preventing anemia were a specially prepared yeast, hog liver and solutions of iron and copper fed simultaneously.

KUGELMASS, New York.

NUTRITIONAL VALUE OF COPPER IN POWDERED WHOLE MILK. R. W. TITUS and J. S. HUGHES, J. Dairy Sc. **12**:90, 1929.

The copper content of whole milk powder resulting from the solvent action of milk on the copper vacuum pans may tend to destroy vitamins. It may also help to prevent anemia. Rats fed on a daily ration of 8 Gm. of milk powder, containing about 0.05 per cent copper, supplemented only with 0.5 mg. of iron, showed excellent growth and production of hemoglobin. No experimental work with copper has been done on human subjects.

KUGELMASS, New York.

MILK ALLERGY. H. HALLARMAN, M. J. & Rec. **130**:147 (Aug. 7) 1929.

A child that had been absolutely normal as long as it received mother's milk developed a severe hemorrhage and colitis as soon as it was put on cow's milk. There was immediate relief when the milk was removed from the diet.

WILLIAMSON, New Orleans.

THE USE OF LACTIC ACID MILK IN FEEDING PREMATURE INFANTS. MORRIS GLEICH, M. J. & Rec. **130**:153 (Aug. 7) 1929.

Lactic acid milk furnishes an excellent substitute for breast milk in feeding premature infants. The presence of acid in the milk enables an infant to tolerate a liberal supply of fat, which accounts for the gain in weight and the general improvement. The care of premature infants at home should be encouraged in order to prevent the children falling prey to diseases of the respiratory tract carried by cross infection in institutions. Premature infant mortality is considerably reduced by the use of lactic acid milk, together with the cooperation of obstetrician and pediatrician. The author found that lactic acid milk gave the best results of all infant foods. It needs no modification and may be continued for the entire year.

WILLIAMSON, New Orleans.

THE NUTRITIVE REQUIREMENTS OF MILCH COWS IN RELATION TO THE COMPOSITION OF THE MILK PRODUCED. NILS HANSSON, Proc. Eighth World's Dairy Cong., 1928, p. 190.

Tests carried out over a period of two decades have shown: 1. The quantity of productive food required by milch cows, with regard both to the general food value of the food and to its albumin content, is to a high degree dependent on the composition of the milk produced. 2. The albuminous substances contained in the food may be limited to the quantities that fulfil the special function of these food substances, since the fat and sugar in the milk are mainly formed from non-nitrogenous food substances, particularly carbohydrates. 3. Milch cows can transfer into the milk a much larger proportion of the digestible energy in the food than can fattening cattle; one can calculate that the latter can only absorb from 78 to 82 per cent of the net energy which the milk produced contains. 4. The nutritive requirements of milch cows is directly dependent on the energy content and the albumin content of the milk produced. 5. The production food required by milch cows may be estimated as 0.30 food unit (defined as the amount of net energy which, with an all-round diet, is recovered in the amount of milk produced by 1 Kg. of barley or by equivalent quantities of other foodstuffs) per kilogram of milk when the fat content of the latter amounts to 2.75 per cent, and to 0.42 food unit when the fat content is 5.0 per cent. 6. Under normal conditions a maximum of 75 per cent of the digestible albumin contained in the food is to be found in the milk. 7. Feeding quantities of albumin amounting to not more than from 10 to 20 per cent above the minimum thus calculated stimulates the yield of milk to some extent, but a further increase in the amount of albumin does not seem to have any further effect. A bibliography of fifteen references is given.

KUGELMASS, New York.

ACTIVATED MILK. HOFFMAN, Proc. Eighth World's Dairy Cong., 1928, p. 460.

The two main difficulties in activating milk by treatment with ultraviolet rays are that the rays must act on a very thin layer of milk and that change of flavor (jecorization) must be avoided. In an apparatus that Hoffman has devised to overcome these difficulties, the milk flows through an adjustable slotted distributor over a narrow-mesh corrugated wire cylindric net in the center of which is the irradiating apparatus. To avoid jecorization the source of light is a sort of quartz Giessler tube with condenser electrodes filled with mercury which emits cold rays instead of the usual quartz lamps which emit intense heat rays. An air lock or the use of a protective gas is unnecessary. Destruction of vitamins A and C by ozone which may be formed when air is permitted to enter the apparatus is of no consequence in the case of pasteurized milk, as these vitamins are already destroyed by pasteurization; with raw milk, a protective gas (preferably nitrogen) can be used. Rats fed for three weeks on rickets-producing food, with an addition of 8 cc. of irradiated milk, showed no signs of rickets as compared with the control animals. Animals suffering from rickets became quite healthy after being fed for four weeks with 6 cc. of ray-treated milk per day, while the animals fed on untreated milk either died or did not recover.

KUGELMASS, New York.

NATURE OF THE RICKETS-PRODUCING FACTOR IN CEREALS. L. MIRVISH, Nature, London **124**:410, 1929.

It has been suggested that the production of rickets by an excess of cereal may be due to an antivitamin. To determine this, oatmeal was boiled with 1 per cent hydrochloric acid and dialyzed. The dialyzate was evaporated to dryness and extracted with 95 per cent alcohol, which was again evaporated. When this residue, dissolved in water, was injected into rabbits, it lowered the blood calcium from 30 to 35 per cent in twenty-four hours, with a return to normal

in forty-eight hours. This action is similar to that of an extract of bovine ovaries made the same way. Rickets is primarily due to the lowering of blood calcium, which, in turn, may be caused by a lack of vitamin D, by an excess of cereals or by faulty calcium.

KUGELMASS, New York.

ACIDAEMIA AND ALKALAEMIA IN THE DIARRHOEA AND VOMITING OF INFANTS. MONTAGUE MAIZELS and CATHERINE B. MCARTHUR, Quart. J. Med. **22**:581 (July) 1929.

Chemical studies of the blood and urine of forty-eight infants suffering from diarrhea and dehydration were made. Determinations of the p_H, plasma bicarbonate, plasma chloride, urea and phosphate were made by various methods. The urine was studied in regard to the p_H, the titratable and ammonia-combined acid, the urea, phosphate and chloride. Values were first determined in a group of normal infants.

Of the 48 cases studied, 28 showed acidosis (with a plasma bicarbonate of less than 0.02 molar) while in 20 there was alkalosis (with a plasma bicarbonate of more than 0.028 molar); in 10 of the 20 cases, the alkalosis was associated with the excretion of an acid urine.

The authors conclude that in most cases of infantile diarrhea and vomiting acidemia is present, but that alkalemia may be found in some. In the latter, the reduction in the osmotic pressure of the blood is often so great that a retention of base occurs, leading to the excretion of an acid urine.

If the urine is neutral or alkaline, if the ammonia coefficient is below 8 per cent, or if the ammonia-combined acid is less than twice as great as the titratable acid, then acidosis is probably absent. In these circumstances, if chloride is persistently absent from urine of average concentration, it is probably advantageous to give extra sodium chloride and it is probably unsafe to administer alkali.

If the urine is acid, the ammonia coefficient is above 8 per cent and the ratio of ammonia-combined acid to titratable acid is greater than 2:5, acidosis is not necessarily present and the bicarbonate reserve of the blood may even be increased.

Clinically, there is nothing distinctive in the cases. Attention is called to the nervous symptoms frequently found associated with alkalemia, such as rigidity, athetosis, tremors, convulsions and muscular twitching, which are similar to those seen in tetany.

BRADFORD, Rochester, N. Y.

IRRADIATION OF STEROLS; RELATIONS BETWEEN IRRADIATED STEROLS AND ANTIRACHITIC VITAMIN. R. FABRE and H. SIMONNET, J. de pharm. et chim. **8**:489 (Dec. 1) 1928.

The studies on irradiation of cholesterol and ergosterol since 1925 are reviewed. The pectroscopic method for the examination of sterols before and after irradiation is discussed in detail, and ultraviolet absorption curves of ergosterol in alcohol solution (1:10,000) before and after irradiation for ten, twenty and thirty minutes are shown. Irradiations alter the mol of ergosterol, producing a trace of a compound that is photochemically unstable but that has pronounced antirachitic properties. A list of thirty-six references is given.

KUGELMASS, New York.

ACROCEPHALOSYNDACTYLIA. L. CAUSSADE and NICOLAS, Paris méd. **2**:399 (Nov. 2) 1929.

The authors report two more cases of this condition. There have been thirty-six cases reported to date. The cases were typical of syndactylism associated with cerebral malformations. Prenatal influences might be concerned with the etiology of one of the cases, and this has been pointed out by former authors.

SANFORD, Chicago.

THE ANTIRACHITIC ACTION OF IRRADIATED SNAIL LIPOIDS. G. MOURIQUAND and A. LEULIER, Paris méd. **2**:409 (Nov. 2) 1929.

In their preliminary report the authors stated that irradiated snail lipoids from an experimental standpoint appeared to possess marked antirachitic powers. This article further carries on the work begun by these experimenters, and they now are definitely able to state that irradaited snail lipoids possess antirachitic properties comparable with viosterol. This has been observed in several cases of florid rickets in infants that were treated with this product.

SANFORD, Chicago.

A CASE OF SCURVY IN AN INFANT. A. BARBOZA, Arch. de pediat., Rio de Janeiro **2**:449 (Oct.) 1929.

The infant suffered from diarrhea, pain on movement of the limbs and loss of weight. The Wassermann reaction was positive. The roentgenograms showed some hemorrhage into the ends of the long bones, but the picture could well have been syphilitic. Antisyphilitic treatment did not cause any decrease in the symptoms, but antiscorbutic treatment caused their complete disappearance.

SANFORD, Chicago.

A CONTRIBUTION TO THE STUDY OF TOXIC INTESTINAL INFECTIONS IN THE CHILD. F. HURTADO GALTES, Bol. Soc. cubana de pediat. **2**:1 (Jan.) 1930.

The manifestations of an intestinal infection of a toxic origin are dependent on the causative organism which disturbs the equilibrium between acidosis and alkalosis. The conditions are such that it is an acidosis that usually occurs. In the course of a toxic intestinal infection, therefore, the body fluids will oscillate between acidity and alkalinity, and will manifest symptoms in accordance with their reaction.

SANFORD, Chicago.

THE SO-CALLED VITAMIN A REACTIONS. GABRIELE MONASTERIO, Biochem. Ztschr. **212**:66, 1929.

Cod liver oil gives positive reactions with arsenic chloride, antimony trichloride, phosphorus pentoxide, sulphuric acid, pyrogallol and resorcinol. The residue from an alcoholic extract of cod liver oil gives a positive reaction with pyrogallol and resorcinol, a doubtful reaction with arsenic chloride and negative reactions in all other tests. After alcoholic extraction, the cod liver oil gives strong reactions in all tests. After heating the cod liver oil in an air stream at 150 C., which destroys its biologic action, all the reactions disappear except the pyrogallol and the resorcinol reactions which still remain strongly positive.

KUGELMASS, New York.

THE VITAMIN B CONTENT OF DIFFERENT YEASTS AND OF WHEAT BREAD PREPARED FROM THEM. ARTHUR SCHEUNERT and MARTIN SCHIEBLICH, Biochem. Ztschr. **212**:80, 1929.

Baker's yeast contains only from one half to one third as much of the antineuritic factor of vitamin B as does brewer's yeast, but shows no difference in regard to the antipellegra and growth promoting factor. Feeding with baked bread containing the usual amount of yeast does not give pigeons the necessary protection, because they cannot consume enough of the food, but the same is true of bread containing three times the ordinary quantity of yeast. In experiments on rats it was possible to demonstrate that bread prepared with baking powder is inferior to that made with yeast.

KUGELMASS, New York.

TREATMENT FOR NERVOUS VOMITING AND VOMITING FOLLOWING PERTUSSIS BY THE USE OF TRICHLORTERTIARYBUTYL ALCOHOL. PAUL FREUD, Deutsche med. Wchnschr. **55**:1256 (July 26) 1929.

The various types of nervous vomiting in children of different ages are briefly discussed. Attention is called to the fact that a large number of remedies are recommended. The more popular of these are outlined. Pyloric spasm is considered but not differentiated from congenital stenosis. In severe cases operation is recommended.

With this introduction the author goes on to report his results with the use of trichlortertiarybutyl alcohol (chlorbutanol). He cites the use of this drug in England and America, quoting its use by H. Molitor to counteract the effect of apomorphine and the report of Bowcock and Hutton as to its value in pernicious vomiting in pregnancy. He used a German proprietary remedy in which the drug was represented in amounts of 0.03 Gm. and later 0.05 Gm. It was used in seventeen cases of nervous vomiting of infants (pylorospasm), fourteen of nervous vomiting of older children and in twenty-three cases of the vomiting accompanying pertussis. Individual case reports are cited. In none of the cases was any unfavorable action noted, except a slight drowsiness after eight or ten days of continual use. This was avoided by the addition of a small dose of caffeine citrate (0.015 Gm.). The drug is not indicated in cases of acute vomiting, such as in gastro-enteritis and acute infections. In the cases described in the report it has proved more useful than other forms of medication that have been recommended.

SCHERER, Duluth, Minn.

THE SIGNIFICANCE OF VITAMINS IN EARLY LIFE. E. VOGT, Klin. Wchnschr. **7**:1941 (Oct. 7) 1928.

The vitamin requirements of the young are exceptionally great. The new-born are fortified with a large vitamin reserve which has been taken from the mother. The vitamin content of colostrum is greater than that of milk. The colostrum and milk intake helps to maintain a vitamin reserve during the first few months of life. Mothers who are nourished on vitamin-deficient diets are apt to have improperly developed or dead babies. The addition of cod liver oil to the diets of mothers enhances the intra-uterine development of the child and reduces the intra-uterine or delivery death rate. The administration of viosterol or of yeast preparations has a similar beneficial effect.

KUGELMASS, New York.

THE EFFECTS OF IRRADIATED ERGOSTEROL. H. SEEL, München. med. Wchnschr. **76**: 1413 (Aug. 23) 1929.

Seel studied the basal metabolism of rachitic rats before and after the addition of irradiated ergosterol to their rickets-producing diet. The basal metabolism of the rats on a rickets-producing diet decreases very soon. The addition of irradiated ergosterol to the diet increases the basal metabolism and cures the rachitic bone changes. The basal metabolism is also raised by the addition of small amounts of phosphorus or iron, but these have no effect on the rachitic bone changes. Large doses of ergosterol (from 1 to 100 mg. per kilogram of body weight) produce anorexia and loss of weight. Rachitic animals are more easily affected by excessively large doses than are normal animals.

BRAHDY, Mount Vernon, N. Y.

RICKETS PROPHYLAXIS. J. AENGENENDT, München. med. Wchnschr. **76**:1417 (Aug. 23) 1929.

The author has treated 700 infants with irradiated ergosterol as a prophylactic against rickets, with satisfactory results. Of interest are fourteen infants with craniotabes which was not affected by the irradiated ergosterol. The softening was in the middle of the occipital bones. In five premature infants the softening appeared after the prophylactic ergosterol had been stopped, and it was refractory

to reinstitution of the treatment. No other rachitic manifestation was found, and the teeth erupted at the proper time. The softening disappeared spontaneously during the sixth or seventh month. Aengenendt thinks that this form of softening of the bone is not due to rickets.

BRAHDY, Mount Vernon, N. Y.

THE THERAPEUTIC DOSAGE OF IRRADIATED ERGOSTEROL. G. KÜHL, München. med. Wchnschr. **76**:1419 (Aug. 23) 1929.

Kühl obtained good results in moderate and severe rickets by giving from 20 to 25 drops of a 1 per cent solution of irradiated ergosterol daily for four to six weeks.

BRAHDY, Mount Vernon, N. Y.

SKIN CHANGES IN INFANTS RECEIVING IRRADIATED ERGOSTEROL. M. RODECURT, München. med. Wchnschr. **76**:1420 (Aug. 23) 1929.

Rodecurt has observed a yellowish-brown pigmentation of the skin in five infants who have received irradiated ergosterol. The patients were not exposed to the sun during the time of observation. The treatment was begun during the first or second month, and the dosage was 5 drops twice daily for seven to twenty-five days.

BRAHDY, Mount Vernon, N. Y.

DIATHESES IN CHILDHOOD. A. REUSS, Wien. klin. Wchnschr. **42**:1365 (Oct. 24) 1929; 1403 (Oct. 31) 1929.

A diathesis is a latent congenital anomaly of constitution, which becomes manifest under the influence of a variety of exogenous factors. There is a full description of the neuropathic and the exudative diathesis. Nothing new is presented.

CLAUSEN, Rochester, N. Y.

THE VITAMIN D UNIT. OTTOKARL SCHULTZ, Ztschr. f. Kinderh. **47**:449 (May) 1929.

Accurate determination of the content of vitamin D of a preparation and its expression in units seems necessary because detection by chemical demonstration in biologic research and detection by research in treatment are unreliable. The roentgen ray and histologic methods have been shown to be reliable indicators of healing in experimental rickets, and the determination of the inorganic phosphate of the serum to be useful but not uniformly certain. In the interests of simplification of the method of research, however, preferably only one method should be chosen which is time-sparing, simple and far reaching in reliability. According to Schultz, histologic control may be dispensed with, since the condition at the beginning of the study, the degree of the malady as well as the condition at the end, and the degree of healing can be told with the utmost certainty from the x-ray pictures. An antirachitic unit of vitamin is the smallest amount of an agent active in the healing of rickets which in a space of twenty-one days can change four plus rickets to an inactive form.

EMERSON, Boston.

THE DIFFUSION OF DEXTROSE AND UREA THROUGH THE PLACENTA. E. BRANDSTRUP, Acta obst. et gynec. Scandinav. **8**:490, 1929.

The author has reviewed the publications relative to the passage of dextrose through the placenta and he believes that the observations may be explained by simple, slow diffusion. He also cites previous investigations of the blood urea in mother and fetus.

He adds twenty observations of his own in which 10 Gm. of urea was given to the mother at varying periods prior to delivery. The blood of the mother was taken prior to this administration and immediately after delivery. The fetal blood was secured from the umbilical cord.

It was found that the amount of urea in both maternal and fetal blood was increased after the administration of the urea if sufficient time elapsed before the infant was delivered. The excess in the maternal blood is more marked up to an hour and a half, and is found in lesser degree up to three hours. After twelve hours the maternal and fetal blood are again identical.

The method used was the micromethod of Rehberg. The process is one of slow diffusions and the slow rate may be explained by the permeability of the syncytium and the slow circulation of blood in the intervillous spaces.

ADAIR, Chicago.

PULMONARY LIPASE IN HUMAN FETUS AND HUMAN NEW-BORN CHILD. T. TACHIBANA, Jap. J. Obst. & Gynec. **12**:82 (June) 1929.

The author investigated the lungs of three fetuses and three new-born infants for the presence of lipase. He also studied fourteen fetuses from the ages of one to eight months to determine when this substance first appeared during fetal life. He further investigated its occurrence in the skin, gallbladder and brain of the fetus and the new-born infant.

The conclusion was that lipase occurs in the lungs of the new-born, and of the fetus as early as the fourth month. The lipase appears later and in smaller amount in the lungs than in the intestines and liver. It appears at about the same period as it does in the stomach and kidneys but in lesser amount. Its occurrence in the skin, gallbladder and brain is questionable.

ADAIR, Chicago.

PHYSIOLOGICAL INVESTIGATION OF THE FETUS. IX. SUPPLEMENTARY RESEARCH OF FERMENTS IN DIGESTIVE ORGANS; LACTASE IN INTESTINAL CANAL. T. TACHIBANA, Jap. J. Obst. & Gynec. **12**:100 (June) 1929.

The author investigated the presence of lactase in the intestinal canal of the human fetus and the new-born. In five new-born infants it was found in all; in five fetuses from the fourth to eighth month of gestation it was constantly present. The author also demonstrated that it comes from the mucous membrane. In analyzing sixteen fetuses of from three to nine months' gestation, he was unable to demonstrate its presence prior to the fourth month.

He concludes that lactase can be demonstrated in the intestinal mucosa of the new-born and of the fetus as early as the fourth month. It increases in quantity with each suceeding month and markedly in the seventh and eighth months. The amount of lactose in the intestinal canal of the new-born is definitely increased by sucking.

ADAIR, Chicago.

PHYSIOLOGICAL INVESTIGATION OF THE FETUS: X. SUPPLEMENTARY RESEARCHES ON THE FERMENTS IN THE DIGESTIVE ORGANS; AMYLASE IN THE INTESTINAL CANAL AND THE LIVER. T. TACHIBANA, Jap. J. Obst. & Gynec. **12**:111 (June) 1929.

The author examined the intestines and liver of two fetuses and three new-born infants for the presence of amylase. The fetuses were of four and seven months' gestation.

He further studied the intestines of fifteen fetuses of from three to nine months' gestation and the livers of seventeen fetuses of a corresponding development and found amylase demonstrated, though feebly, as early as the third month and that it increases rapidly with each succeeding month.

He concluded that amylase occurs in the intestinal canal of the human fetus and new-born and that it originates in the mucosa. It is also present in the liver of both fetus and new-born where its production is more marked than in the intestines. The quantity in both tissues increases with each succeeding month of fetal life.

ADAIR, Chicago.

Prenatal Conditions

MECONIUM ILEUS WITH CONGENITAL STENOSIS OF THE MAIN PANCREATIC DUCT. BORRIS A. KORNBLITH and SADAO OTANI, Am. J. Path. **5**:249, 1929.

A case of meconium ileus is presented with the rare anomaly of congenital stenosis of the duct of Wirsung. The absence of pancreatic juice caused inspissation of meconium, with subsequent intestinal obstruction, ileus and perforation.

AUTHORS' SUMMARY (ARCH. PATH.).

TWO OF THE RARER CONGENITAL ANOMALIES OF THE HEART. ISTVAN GÁSPÁR, Am. J. Path. **5**:285, 1929.

A congenital anomaly of the heart is presented, in which an isolated transposition of ventricles occurred. Both large arteries, the aorta and the pulmonary artery, arose from the left ventricle. This is explained by an imperfect rotation of the septum trunci which divided the truncus arteriosus, causing an aortic stenosis. A very small subaortic defect was found. The independent behavior of the ductus arteriosus and its importance in relationship to the dangerous results of the case are also pointed out.

AUTHOR'S SUMMARY (ARCH. PATH.).

DETORSION DEFECTS IN CONGENITAL CARDIAC ANOMALIES. PHILIP F. SHAPIRO, Arch. Path. **9**:54 (Jan.) 1930.

The author describes three cases of complex congenital cardiac anomalies. He gives an excellent account of the embryology of the heart, and he explains the defects in these cases as due to lack of the normal torsion of the cardiac tube. Other defects were due to deficiency in growth vitality or were secondary to the changes produced by the detorsion. The article is excellently written and the details well worth reading.

LESLIE, Evanston, Ill.

A CASE OF COARCTATION OF THE AORTA. A. P. THOMSON and F. W. M. LAMB, Arch. Dis. Childhood **4**:377 (Dec.) 1929.

A case is reported in a girl, aged 5 years, which was diagnosed antemortem. The patient was a thin, active, poorly developed child with a heart enlarged to the left. The apex beat was forceful, but diffuse. In the fifth interspace, two and one-half inches (6.3 cm.) from the midsternal line there was a systolic bruit over the precordia, most marked at the base, but transmitted up the great vessels. The second sound was clear. The left hand to the wrist was dusky blue and congested. This symptom was most marked when the hands were held over the head. Then the right became pallid. The left brachial pulse was of smaller volume than the right. The pulsation in the femoral arteries was distinctly feeble. The retinal vessels were small and tortuous. The blood pressure taken on the arms showed: systolic pressure from 220 to 200 mm., and diastolic from 190 to 160 mm. in the left arm; in the right, systolic pressure ranged from 215 to 175 mm., and diastolic from 145 to 120 mm. The pressure in the popliteal arteries was constant and equal on the two sides at 125 mm. The child had an attack of lobar pneumonia during which time the arteries became markedly sclerotic. The child died suddenly at home. Postmortem examination was made. The enlargement of the heart was due mainly to hypertrophy of the left ventricle. The ascending aorta was dilated and shiny, with a thickening of the outer coat. Opposite the origin of the left subclavian the ductus arteriosus joined the arch and was not patent. Above this point and for a considerable distance below it the aorta was greatly constricted, but not obliterated. The stenosis was most marked ⅜ of an inch (0.95 cm.) below the left subclavian. Sections from the aorta showed an increase in the fibrous tissue in the region of the vasa vasorum. There was also considerable sclerosis of the femoral, brachial, renal and splenic arteries.

PETERMAN, Milwaukee.

HEREDITARY HYPERTELORISM WITHOUT MENTAL DEFICIENCY. T. MCCOWATT MONTFORD, Arch. Dis. Childhood **4**:381 (Dec.) 1929.

A case of hereditary hypertelorism in a girl, 2 years of age, is described; photographs are shown. The girl was said to be an exact likeness of her mother. A subsequent child, a boy, presented no abnormalities. PETERMAN, Milwaukee.

NOTE ON A FAMILY WITH BRACHYDACTYLY. ROBERT MARSHALL, Arch. Dis. Childhood **4**:385 (Dec.) 1929.

This condition is described in a mother, a child and an aunt. The great grandmother, grandmother and uncle were said to have presented similar deformities. The shortening of the fingers was associated with apparent absence of the middle phalanges. This is said to be the first human condition found to obey mendelian laws. Photographs and roentgenograms illustrate the condition.

PETERMAN, Milwaukee.

A TYPICAL CASE OF ANENCEPHALIA. M. DA ROCHA, JR., Arch. de pediat. de Rio de Janeiro **2**:487 (Nov.) 1929.

The child lived for thirty-six hours. The head ended abruptly above the eyes, which were enlarged and protruding. Convulsive movements of the extremities were noted. The corneal reflex was present, and the tendon reflexes were exaggerated. Autopsy revealed a rudimentary cerebellum. SANFORD, Chicago.

DEVELOPMENTAL ANOMALIES IN THE CEREBELLUMS OF EMBRYOS. JOSEPH C. YASKIN, Arb. a. d. neurol. Inst. a. d. Wien. Univ. **31**:13, 1929.

Ten embryos, varying from 85 to 210 mm. in length, were examined. A large series of anomalies in the cerebellum were found in these embryos although they were much older than those that had been studied by previous observers. The most important anomaly was the persistence of a canal lined with ependyma; the next important one was a median and paramedian collection of germinal cells, and finally, if not true cysts, at least a change in the ventral side of the cerebellar lobe in the nature of a zone spongiosa — a precursor of fetal cysts. In addition to these, there were also found in the fetal cerebellums hemorrhages which had a peculiar localization and which could well be regarded as the cause of later malformations. KESCHNER, New York.

THE DIET DURING PREGNANCY WITH REFERENCE TO THE VITAMIN REQUIREMENTS OF THE FETUS. E. VOGT, München. med. Wchnschr. **76**:1959 (Nov. 22) 1929.

The vitamin requirement of the fetus is very high. Most vitamins cannot be formed in vivo; therefore the mother must be given a diet rich in vitamin-containing foods. The diet may be supplemented by cod liver oil, dried yeast and viosterol. The author has found that deficiency in vitamin B may lead to abortion or premature delivery, and that deficiency in vitamin C causes disturbances in the formation of the blood, bones and teeth. BRAHDY, Mt. Vernon, N. Y.

CENTRAL FISTULA OF THE NECK. VLADIMIR HLAVAČEK, Časop. lék. česk. **66**: 511 (March 28) 1927.

Two cases of chronic midline fistula of the neck are reported at the age of 8 and 22. Both were preceded by cystlike formations, rupture of which was followed by the fistula. Treatment of various types was of no avail. Operation revealed that one sinus extended back to the base of the tongue and the other involved the hyoid bone. Histologic examination revealed thyroid tissue clumps along the tract and within the body of the hyoid. Healing took place only after

removal of the entire fistulous tract and the median portion of the hyoid bone. Before operation, repeated new cyst formation took place.

Photomicrographs are included.

STULIK, Chicago.

THE CARDIAC NERVES OF THE HUMAN FETUS. IHDIMA, Jap. J. Obst. & Gynec. **12**:234 (Sept.) 1929.

In the fetus of one month the cardiac nerves cannot be shown. They are present only in the auricles in the second month. About the middle of the second month, nerves running from the auricle to the upper part of the ventricle can be demonstrated; in the latter part of the second month nerves are present all over the heart but are small; they are not found in the endocardium, where they appear late in the third or early in the fourth month.

During the latter half of pregnancy and especially in the tenth month numerous nerves are present in every part of the heart. The nerve-endings are simple; they penetrate the muscular membrane and terminate with enlarged tips, in contact with the nuclei.

The nerve fibers are numerous in the auricle and upper endocardium during the tenth month, and form the subendocardial and intra-endocardial plexuses. The endings are dendritic and between the endocardial cells.

ADAIR, Chicago.

IRON CONTENT IN THE MATERNAL AND FETAL BLOOD. S. NAKAYAMA and S. INOUE, Jap. J. Obst. & Gynec. **12**:273 (Sept.) 1929.

Primiparas have on an average a higher iron content than multiparas.

Newly born female infants have a slightly higher iron content than male infants but their hemoglobin is lower and the number of erythrocytes about the same.

In the parturient woman the iron content is lowered about 28 per cent as compared with the mature nonpregnant woman.

The blood of the umbilical vein has a 15 per cent higher iron content than the maternal blood and exceeds by about 12 per cent that of normal nonpregnant women.

Newly born infants with a high iron content in the umbilical blood seem to be more disposed to jaundice.

ADAIR, Chicago.

PERMEABILITY OF THE PLACENTA. KONAN SHI, Jap. J. Obst. & Gynec. **12**:275 (Sept.) 1929.

The author has attempted to gain information relative to the permeability of the placenta and the function of the fetal kidneys and liver.

He injected into pregnant rabbits 10 cc. of a 1 per cent watery solution of twenty-three different dyes.

He examined the amniotic fluid, body cavities, gastro-intestinal tract, gallbladder and urinary bladder of the fetus for the presence of coloring matter. He reports that all dyes were found in the amniotic fluid after they passed through the placenta; they were also found in the fetus. He also says that he was able to show neutral red and cochineal red in the gallbladder of the older fetuses.

ADAIR, Chicago.

Diseases of the New-Born

DANGER SIGNALS IN NEW-BORN INFANTS. JULIUS LEVY, Arch. Pediat. **46**:707 (Nov.) 1929.

For the past fourteen years in the city of Newark, N. J., there has been practically no reduction in the mortality during the first month of life. Among the colored infants the deaths in the first month represent more than one half of all

the deaths that occur in the first year. After the first month the mortality for the first year is twice as great among the colored as among the white infants.

Cerebral hemorrhage is more common than is generally thought. It occurs in about one third of all births, often without symptoms. Failure to nurse is a cardinal symptom. The infant makes little effort to grasp the nipple or to leave the nipple; it is apathetic. Normal infants squirm and cry if unable to grasp the nipple. One should be suspicious of the newly born infant that does not cry. His cry is abnormal, is not readily provoked and is not sustained. His crying stops as soon as the irritation causing the cry is discontinued.

Loss of weight and rising temperature may go hand in hand. An ounce of water every three hours, with possibly a 5 or 10 per cent solution of dextrose will help tide the infant over until the mother secretes sufficient milk.

Subnormal temperature is a danger signal and should be guarded against. Loss of weight should be avoided. Sudden rise of temperature may be due to infection, disturbances of metabolism, particularly insufficient water supply, or an excessive supply of artificial heat.

Vomiting at about 4 to 8 weeks of age should suggest pylorospasm or pyloric stenosis. The vomiting starts suddenly and is more profuse than the usual regurgitation or vomiting from indigestion. Occasionally one, two or three feedings are retained. Loss of weight, peristaltic wave, pyloric tumor and mucoid stools should be looked for. Atropine in adequate dosage will control the condition in practically every case.

WILSON, Norfolk, Va.

ENLARGED THYMUS IN THE NEW-BORN. ARTHUR C. SINGLETON, Canad. M. A. J. **22**:23 (Jan.) 1930.

The results of roentgen examination in ninety-five consecutive new-born infants are reported. The technic consisted of: 60 kilovolts, 25 milliamperes, 40 inches target skin distance, 1/10 second exposure centering at the level of third intercostal space anteriorly. Any measurement over 3.5 cm. was taken as representing enlargement in a new-born child.

Thirty-five per cent of the infants showed an enlarged thymus.

The authors advise roentgen treatment either when enlargement is demonstrated or when thymic symptoms are present.

MOORE, Omaha.

WALKING EFFORTS OF THE NEW-BORN. ALBRECHT PEIPER, Monatschr. f. Kinderh. **45**:444 (Dec.) 1929.

If a new-born infant is held under the arms and raised to a standing position, with the trunk tilted slightly forward, he will make stepping movements. These movements differ from ordinary walking in that they are limited to the legs, with no associated movement of the body. The author gives a few illustrations.

GERSTLEY, Chicago.

Acute Infections

EARLY RHEUMATIC INFECTIONS OF CHILDHOOD. C. C. MCLEAN, Arch. Pediat. **46**:657 (Nov.) 1929.

One hundred and eighteen cases in children from 2 to 13 years of age are reported; these included fifty-one boys and sixty-seven girls. The chief age incidence was from 3 to 9 years.

Eighty-nine of the patients gave a history of repeated attacks of tonsillitis, with nasopharyngeal infection. Sixty-seven per cent had pains in the extremities. Forty-two, or 35 per cent, had mild chorea; 52.3 per cent of the chorea patients and 81.5 per cent of the remainder had a soft systolic cardiac murmur. Roentgen studies showed little or no cardiac enlargement. Of the entire group, 87.3 per cent were underweight. In fifty-seven cases the focus of infection was in the tonsils; of these, 94.7 per cent showed soft blowing systolic murmurs. In sixteen

cases in which the focus was located in the teeth, only 25 per cent showed cardiac murmurs. The blood counts ranged from 6,000 to 31,000; usually from 7,000 to 15,000.

In the early rheumatic cases, the patients are kept in bed from four to six weeks with the exception of four hours a day during which they are usually allowed to do as they please. They are given a six meal diet, with emphasis on spinach, prunes, whole wheat and cereals. They are also given cod liver oil and iron.

WILSON, Norfolk, Va.

MULTIPLE CASES OF EPIDEMIC MENINGITIS IN THE SAME FAMILY. ARCHIBALD HOYNE and E. T. MCENERY, Arch. Pediat. **46**:699 (Nov.) 1929.

Three cases of epidemic meningococcic meningitis are reported in one family. The subsequent cases developed within six and sixteen days, respectively, after the first case. The first patient, a boy aged 10 years, died; the second, a girl aged 3½ years, recovered, and the third, a boy aged 16 months, recovered after the loss of one eye from a concomitant *Streptococcus viridans* panophthalmitis. Two other cases of epidemic meningitis occurring simultaneously in a boy, aged 5 years, and his sister, aged 2½ years, are reported.

A mother and three children were stricken within three days; these cases were seen at the Cook County Contagious Disease Hospital. The authors emphasize the increase of spinal fluid sugar as a good omen and its diminution as correspondingly unfavorable.

WILSON, Norfolk, Va.

CASE OF ENCEPHALITIS SECONDARY TO CHICKENPOX. CHARLES E. CONRAD, Arch. Pediat. **46**:716 (Nov.) 1929.

A boy, aged 4 years, developed chickenpox on Feb. 7, 1928. On February 14, eight days after onset, his gait was unsteady. His deep reflexes were diminished and there was incoordination in both hands. The urine was normal. The white blood cells numbered 16,400, the polymorphonuclears 87 per cent and the small lymphocytes 13 per cent; the Wassermann reaction was negative. Lumbar puncture showed fluid under 14 mm. pressure, and 15 cells. There was no globulin; sugar was increased, and the Wassermann reaction was negative.

The patient gradually improved. On April 3 he was apparently normal in every respect.

WILSON, Norfolk, Va.

ABDOMINAL DISTENTION AS A COMPLICATION OF PNEUMONIA IN INFANTS. H. P. FINE, M. J. & Rec. **131**:25 (Jan.) 1930.

Abdominal distention is one of the gravest complications of pneumonia, especially in the pneumonia of infants. There are two types of distention: (1) the type that comes on early in the course of the disease, which is apparently due to some gastro-intestinal disturbance and which can be controlled by simple means, and (2) the persistent intractable distention that comes on in midcourse or late in the disease, which seems to defy the best and most heroic measures of treatment. This is thought to be due to the profound toxicity, producing intestinal paresis. The author then discusses the importance of prophylaxis and treatment in these cases.

WILLIAMSON, New Orleans.

THE RHEUMATIC SYNDROME IN CHILDREN. T. HOMER COFFEN and HOMER P. RUSH, Northwest Med. **28**:524 (Nov.) 1929.

A survey of heart disease in the Pacific Northwest shows an incidence of only 0.1 per cent as compared with general statistics of from 0.2 to 4.8 per cent. This fact leads to doubt in the authors' minds as to whether there is actually less heart disease or whether it assumes less typical forms. They believe that

the prevention of heart disease in children is the prevention of rheumatic fever, tonsilitis, chorea, sinusitis, growing pains, exanthematous diseases and the acute nephritis of childhood. Children affected with these conditions should be treated with salicylates and closely watched until 12 years of age.

SCOTT, Philadelphia.

CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **44**:3185 (Dec. 27) 1929.

In the month of November there were 3,042 cases of smallpox reported, or 75 per cent above the average of the last three years. There were 446 cases of meningitis (meningococcus), which was double the average of recent years. The occurrence of poliomyelitis, measles and diphtheria was below the average.

SANFORD, Chicago.

SUMMARY OF CURRENT PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **45**:177 (Jan. 24) 1930.

During the month of December, smallpox and meningococcus meningitis were higher in incidence than they have been for the last three years. Measles and diphtheria were lower than in the last four years. Mortality from all causes in large cities was 13.4 per thousand. Last year the rate was 15.6, owing to the spread of influenza.

SANFORD, Chicago.

THE IMMUNIZING DOSE OF VACCINIA. PETER A. CLEARKIN, Brit. J. Exper. Path. **10**:237, 1929.

Very small quantities of vaccinia virus protect against enormous doses. Before standardization of vaccine lymph becomes feasible it must be prepared in a more stable form.

AUTHOR'S SUMMARY.

THE CARE AND PREVENTION OF RHEUMATISM IN CHILDHOOD. LEONARD FINDLAY, Edinburgh M. J. (Tr. Med.-Chir. Soc.) **36**:203 (Oct.) 1929.

Findlay discusses the place of salicylates in the treatment for rheumatism; he thinks that they are of use only in curing the joint manifestations. They have no effect on carditis, chorea, or nodules; the latter he has seen appear during salicylate administration.

Findlay regards tonsils as the route of virus entry. Diseases of the tonsils are common in every class, but rheumatism is rare among the so-called better classes. He analyzes the results of operations for the removal of tonsils which took place under his observation for three years. There were one hundred and thirty-eight patients observed for five to eight years, partly before and after operation. Among these, after the operation, arthritis developed in three patients, and chorea in seven. In patients tonsillectomized during the course of the disease, the incidence of cases of arthritis and chorea was less after than before, but the total number of attacks was about the same as in those patients not operated on. The incidence of cardiac disease was least in these cases of arthritis in which tonsillectomy was done. There was more carditis in patients with arthritis whose throats were normal and who still had tonsils.

The cardiac clinic which has been operated since 1923 in Glasgow has supervised the care and treatment in rheumatic cases. Eighty children, all of whom have been kept in bed for at least three months, have been watched for five years. Findlay considers that the ravages of the disease have not been materially controlled, and the results not equal to the efforts expended.

The experience of the author in Glasgow indicates that after rheumatism has developed little good can be accomplished. Prophylaxis is the chief means of attack on rheumatism. He suggests the provision of healthy homes for the poorer classes of the community.

NEFF, Kansas City, Mo.

THE HISTOLOGY OF EXPERIMENTAL POLIOMYELITIS. E. WESTON HURST, J. Path. & Bact. **32**:457, 1929.

Poliomyelitis is an inflammatory disease of the whole nervous system with especial involvement of the anterior horn cells; there is at present no reason forthcoming for this peculiar distribution of the most severe lesions. The nerve cells are primarily affected by the virus, and their degeneration is not attributable to the accompanying interstitial inflammation. The cellular reaction is described in detail, and the rôle played by polymorphonuclear leukocytes and by the microglia is emphasized; the various stages of evolution of the latter correspond to the "polyblasts," "elongated glial cells," etc., of the older authors. Meningitis is not a necessary feature of the disease and is often not marked in the early stages. The hemorrhages seen with some frequency result, at least in some cases, from slight trauma at autopsy to the greatly congested vessels.

AUTHOR'S SUMMARY.

ACUTE DISSEMINATED ENCEPHALOMYELITIS FOLLOWING VACCINATION. CECIL D. COYLE and E. WESTON HURST, Lancet **2**:1246 (Dec. 14) 1929.

A girl, aged 5 years, convalescing from an attack of bronchopneumonia was vaccinated twelve days after the subsidence of fever because a child in the same ward developed the rash of smallpox. On the thirteenth day after vaccination the child appeared excited; she ran about and struck other children. Headache and a temperature of 101.6 F. were observed on the following morning; in the afternoon, drowsiness becoming progressively deeper, slight cyanosis, ptosis of the right upper lid, stiffness of the neck, twitching of the left angle of the mouth and definite weakness of the right arm and leg. The knee jerks were active, and there was bilateral ankle clonus.

There were two vaccination crusts, half an inch (1.27 cm.) in diameter in the left deltoid region, with a slight surrounding fading redness. No glands were palpable in the left axilla.

The following day (the fifteenth after vaccination) her color was worse. Cheyne-Stokes' breathing set in, and she died on that day.

Another girl, aged 5 years, previously unvaccinated, had been vaccinated with the other half of the same tube. She was convalescing from furunculosis of the right external auditory meatus. On the morning of the fifteenth day, she vomited and her temperature rose to 102 F. She was definitely drowsy. The fever rose to 103 F. and then subsided the next day. Nothing further ensued.

Thirteen other contacts were vaccinated and showed no abnormal reactions.

The important autopsy observations were: (1) perivascular infiltration, and (2) extra-adventitial infiltration, with demyelination of the area immediately surrounding the vessel.

The cerebral hemispheres, the cerebellum and particularly the midbrain, pons and spinal cord were involved. A feature of the disease in the cord was the severe involvement of one segment and the entire freedom from lesions of a closely adjacent segment.

A second and unusual feature at almost all levels was the striking limitation of the lesions to the right half of the cord, the other being wholly or almost wholly spared; at the same time, the gray matter in many segments was more severely affected than the white.

LANGMANN, New York.

SCHICK'S TEST AND ITS APPLICATION. SHELDON F. DUDLEY, Quart. J. Med. **22**:321 (Jan.) 1929.

This is an excellent monograph, comprising fifty-four pages concerning the Schick test and its applications, with a critical review of the literature. A bibliography of 105 references is given. The various phases of the relationship of the test to susceptibility and immunity in diphtheria are discussed. The discussion of primary and secondary antigenic stimuli is particularly impressive. The

author states that the application of the test in the control of diphtheria has thrown considerable light on some of the other difficult problems of epidemiology.

BRADFORD, Rochester, N. Y.

CLINICAL, EPIDEMIOLOGIC AND PROPHYLACTIC AFFINITY OF MEASLES AND WHOOPING COUGH. W. MIKULOWSKI, Arch. de méd. d. enf. **32**:701 (Dec.) 1929.

An attempt is made to parallel the natural histories of measles and whooping cough, everywhere recognized as the major infections of early life. So far as morbidity and mortality rates are concerned, and particularly with respect to such demographic features as age, season, social status, density of population and prophylaxis, the analogy is striking. From statistics gathered in many European countries since 1861, one finds, for example, that the mortality per million in measles is 254, and in whooping cough 240. In the British Isles, from 1881 to 1885, there were 61,830 deaths from measles and 61,260 from whooping cough; in Belgium, from 1901 to 1905, there were reported 10,135 deaths from measles and 10,020 from whooping cough. Similar returns are quoted from France, Holland, Sweden and Austria. The registration area of the United States gives corresponding figures: During the period from 1901 to 1920, there were reported 105,115 deaths from measles and 120,486 from whooping cough. In all instances, not only the total mortality but the percentage for various ages is almost identical. The preponderant losses from these infections during the first three years of life is strongly emphasized and comparisons are made with the mortality rates for scarlet fever and diphtheria. Seligman states that compilations made at Berlin from health reports of 544 cities show that for the year 1926 there were 7,446 deaths from measles and 7,108 from whooping cough.

Meteorologic studies exhibit the same consonance. Winter and spring months provide conditions suitable for the development and spread of epidemics and for the appearance of the complications so frequently fatal in morbilli and pertussis. Another aspect of the peculiar affinity of these diseases is shown in the fact that both are dangerous directly in proportion to the density of the population, the squalor, poverty and generally low standard of living in the tenement districts of great cities, where rickets, digestive disturbances, hereditary syphilis and tuberculosis are common, favoring a high mortality.

Hospitals for infectious diseases are no longer held to be responsible for the increased death rate, as it can be fairly well shown in most instances that patients often enter with essentially fatal complications. In addition, serologic treatment for measles in all properly equipped institutions more than counterbalances the menace of cross infections. Mikulowski recalls that epidemics of measles are almost invariably followed by epidemics of whooping cough; often they coexist in a community. Pediatricians are daily reminded of this in the mother's report: "My baby had measles and then contracted whooping cough."

From these facts, the author constructs the theory that measles activates the infection of whooping cough, which may be dormant in an infant for months or years after an invasion, and lowers still further the resistance of the patient to bacterial toxins. He reports many cases in support of this contention and urges more complete isolation of patients entering the measles ward with a history of pertussis.

AMESSE, Denver.

BRADYCARDIA IN INFANTS DURING CONVASLESCENCE FROM TYPHUS FEVER. MEZBOURIAN, Arch. de méd. d. enf. **32**:722 (Dec.) 1929.

Wide experience with the epidemiologic features of exanthematic typhus in Constantinople has impressed the author with the striking dissimilarity between the adult and the infant response to invasion. As observed by all clinicians in the treatment for yellow fever, children are prone to exhibit only the benign forms, and a still further resemblance between typhus and yellow fever is shown

by the frequent dissociation of the pulse and temperature rates during convalescence. In the febrile stage of typhus of early life, the pulse rate usually mounts rapidly to 120 or even 140, although the temperature may not exceed 101 F. during the entire period. With defervescence, the child's condition rapidly improves, and the prolonged convalescence of adults is replaced by an almost immediate return to normal function, with the sole exception of the circulatory apparatus. Frequent examination of the pulse will reveal a bradycardia of marked degree, the rate often dropping to 60 or even less; with this tardy action one may note in certain cases intermissions and other irregularities continuing for one or two weeks. After a period of transitory bradycardia the pulse rate commonly returns to the normal of from 70 to 80. Mezbourian believes that the virus of typhus has a special predilection for the cardiovascular system at all ages, which is equally shown in the mild attacks of infancy and the grave hyperthermic types of adult life. He reviews a case in a boy aged 11, who was sick for thirteen days, with a temperature not exceeding 102.5 F. at any time and with a pulse rate varying between 110 and 130; in the brief stage of convalescence the pulse dropped rapidly to 70 per minute, then to 40 or 50 and during the following month it occasionally reached a minimum of 36 or 38. Typhus may therefore properly be classified among those diseases having a special affinity for the myocardium, such as rheumatic fever, diphtheria, scarlatina, yellow fever and pneumonia. Not only the musculature of the heart but its nervous apparatus may be influenced by even the mildest attacks; the noticeable bradycardia may be due to disturbances of conduction through the bundle of His, without other demonstrable cardiac or extracardiac lesions. It is pointed out, however, that before one can ascribe such clinical phenomena to a given infection, a report of previous examinations must be available, in order to exclude congenital or familial heart disease.

AMESSE, Denver.

PECULIARITIES OF THE KRUSE-SONNE TYPE OF DYSENTERY IN CHILDHOOD. G. ABRAHAM, Monatschr. f. Kinderh. **45**:385 (Dec.) 1929.

Report of seventy cases of dysentery of the Kruse-Sonne type from January, 1928, to October, 1929. The author reports this series to establish two points: 1. The diagnosis of this type of dysentery can be suspected by the nature of the stools, which are always bloody and full of mucus. 2. There is a decided difference in the reaction of infants and older children. While infants have typical gastro-enteritis, they are not as acutely ill as the older children. In the latter, the course of the disease is stormy, with general symptoms that are like toxic typhoid.

GERSTLEY, Chicago.

OBSERVATIONS DURING AN OUTBREAK OF SCARLET FEVER IN A MILITARY SCHOOL. HIPPKE, München. med. Wchnschr. **76**:1873 (Nov. 8) 1929.

In a military school of 750 students, scarlet fever developed in a division numbering 193. Isolation of the entire division twenty-four hours after the first case developed prevented the spread of the disease to the rest of the school. Of the 193 students intimately exposed, 81 (42 per cent) contracted scarlet fever. Forty-six of the students had had scarlet fever, and 17 of this group had a second attack. The exanthem appeared in only 29 cases, but the associated symptoms were so characteristic in those without a rash that the diagnosis was certain. Smears were taken on the third day of the illness in 11 cases and a pure culture of *Streptococcus viridans* was found. Six weeks later, cultures taken of the entire group were negative for *Streptococcus viridans* in half the cases and showed only an occasional growth in the others. Cultures taken at the end of three months showed occasional *Streptococcus viridans* growth in 21 and *Streptococcus hemolyticus* in 15. Other bacteria, of course, were present in all cultures. The patients were discharged at the end of from four to six weeks and there were no return cases.

BRAHDY, Mt. Vernon, N. Y.

ENCEPHALITIS POSTVACCINATORIA. W. KNÖPFELMACHER, Wien. klin. Wchnschr. **43**:97 (Jan. 23) 1930.

The author give a valuable review of the literature. He remarks that he knows of no case of encephalitis following intradermal inoculation.

CLAUSEN, Rochester, N. Y.

THE PNEUMONIA OF WHOOPING-COUGH: I. PATHOLOGIC ANATOMY OF THE LUNGS IN WHOOPING-COUGH, IN ADDITION TO AN EXPERIMENTAL STUDY OF THE X-RAY PICTURE OF THE LUNGS IN PERTUSSIS IN MAN. T. HAYAKAWA, Ztschr. f. Kinderh. **47**:532 (May) 1929.

The endotoxin of the Bordet-Gengou bacilli may call forth a constant pathologic-anatomic change in the lung tissue of rabbits, if it is given intravenously. With a lethal or still stronger dose one constantly finds a high grade hyperemia, and many times blood in the interstitium of the alveolar and bronchial system, but if a small amount of toxin, from about one twentieth to one thirtieth of the lethal dose is repeated in the preliminary stage, cell infiltration and slight edema of the interstitial tissue are found and after about seven days, proliferation chiefly of connective tissue, especially in the bronchi and the vessels. According to the results given, the typical x-ray picture of the lung in whooping-cough is to be ascribed less to the simple hyperemia of the bronchial wall, as some authors contend, than to an inflammatory process interstitially. Changes found by Hayakawa in the lymphatic apparatus in the bronchi must stand in close connection with this inflammatory process in the interstitium and apparently have a share in the formation of the x-ray picture of the lung. Even if the inflammatory process of the interstitium, as a pathologic-anatomic substrate of the lungs in the usual cases, does not always result in some contingent disturbances of function of the lungs, it may, especially in persons with severe spasms of coughing, contribute to disturbances of the circulation and to the histologic changes in the lung parenchyma, which have great significance especially in secondary infection. The different circulatory changes which one is accustomed to meet in cases of pertussis rest partly on a mechanical increase of pressure in the spasm of coughing. Hayakawa shows that the primary danger to the vessel wall, as the result of the injury by the endotoxin of the bacilli of pertussis, must not go without attention.

EMERSON, Boston.

STUDIES ON THE BRAIN IN WHOOPING COUGH. FIRST COMMUNICATION. HISTOLOGIC STUDIES ON THE BRAIN OF PERTUSSIS IN MAN. Y. YAMAOKA, Ztschr. f. Kinderh. **47**:543 (May) 1929.

The central nervous system of three cases of pertussis was studied histologically and pathologically. Neither hemorrhage nor inflammation was found, and while in one case without convulsions no significant changes were demonstrated, there were in two cases with convulsions singular changes with characteristic and elective localization in the parenchyma. Though in one of these patients who had mild convulsions, only the cerebellum was changed; in the other, where there were severe convulsions, Ammon's horn, Sommer's sector and the end leaf, excepting the thick zone, in addition to the Purkinje cell layer of the cerebellum, the anterior half of the palladium and the anterior nucleus of the thalamus were altered. The changes consisted of ischemia or homogenization of vasogenic origin, with the accompanying glia cells and capillary proliferation. There territories are exactly the places which are deficiently provided with capillaries and vessels, and since the vessels concerned themselves show no demonstrable change, might we not assume that a functional disturbance of the circulation, perhaps an angiospasm, is responsible. But if we consider the fact that the degree of change runs parallel with the severity of the convulsion in the individual case, we may be permitted, perhaps, to come to the conclusion that the angiospasm of the cerebral vessels has a close relation to the convulsions of whooping cough.

EMERSON, Boston.

MENINGOCOCCAL SEPSIS ("SPOTTED FEVER"). P. H. KRAMER, Nederl. tijdschr. v. geneesk. **2**:3471 (July 27) 1929.

An infection with the meningococcus of Weichselbaum may give rise to three clinical pictures. Most common is meningococcal meningitis. Secondly an inflammation of the mucous membranes of nose and throat can occur, caused by the meningococcus but without further symptoms. Only by means of a bacteriologic investigation can the real nature of the process be detected here. Finally the meningococcus may cause a sepsis ("spotted fever"). Within a short time, the author observed five cases of "spotted fever." In all cases the sepsis and especially an extensive exanthem of the skin prevailed from the beginning, and the symptoms of meningitis usually appeared in a latter stage of the disease.

The first case occurred in a boy who became ill quite suddenly with high fever. The skin was full of purpural spots. No hemorrhages were observed in the mouth and the throat. There was no symptoms of meningitis during the first days of the disease. On the third day the picture of meningitis was present; meningococcus was found in the cerebrospinal fluid. The temperature remained high and the boy died on the next day. In the second case, which occurred in a boy aged 2 years, the disease lasted only thirty-two hours. The boy died soon after entrance into the hospital, with distinct symptoms of meningitis, high fever and numerous purpuric spots on the skin. Meningococci were present in the cerebrospinal fluid. The third case was that of a child aged 1½ years. Here too the beginning was sudden. In this case the sepsis had given rise to large blood extravasations on the face and the extremities. At autopsy no hemorrhages were found in the internal organs. Meningococcus was present in the cerebrospinal fluid.

In two other cases, a brother and sister, total recovery followed. The clinical picture was the same as in the cases in which the patients died.

The exanthem in spotted fever may closely resemble that in typhus exanthematicus. In spotted fever the petechial exanthem usually comes quicker and earlier, but without an exact anamnesis the differential diagnosis may give rise to great difficulties.

VAN CREVELD, Amsterdam, Holland.

Chronic Infections

TUBERCULOSIS IN PUBLIC-SCHOOL CHILDREN. EUGENE L. OPIE, H. R. M. LANDIS, F. MAURICE MCPHEDRAN and H. W. HETHERINGTON, Am. Rev. Tuberc. **20**:413 (Oct.) 1929.

The present study is an attempt to apply the knowledge of latent tuberculosis that has been recently acquired by the investigation of the spread of tuberculosis in families to the recognition and control of tuberculosis in schools. In addition to the children with clinical tuberculosis, there is a large group of children with advanced tuberculosis unaccompanied by symptoms or physical signs. The latter group may be further subdivided into those who will probably always remain in good health and those in whom the disease, unless checked, will probably become clinical tuberculosis.

Children presenting only the following evidences of tuberculous infection do not require special care: (1) infection demonstrated by tuberculin reaction only with negative roentgenologic observations; (2) circumscribed nodules in the lung substance that have undergone calcification; (3) partly calcified tracheobronchial lymph nodes, unless the child is in contact with open tuberculosis, or unless the lesions are unusually large or numerous or are associated with evidences of impaired health.

On the other hand, children falling within the following classes should be given the benefit of tuberculosis-nutrition classes or preventorium care: (1) manifest pulmonary tuberculosis without evidence that the lesion is active; (2) latent apical tuberculosis with the appearance of activity; this occurs most frequently in adolescent children between the ages of 12 to 18, and may be found without any signs of ill health; (3) latent tuberculosis infiltration of the lung, often associated with

tuberculosis of the tracheobronchial lymph nodes; (4) tuberculosis of the tracheobronchial lymph nodes, even though partly calcified, when the child is in contact with open tuberculosis, when the lesions are very large or when there is evidence of impaired health.

In the recognition of the foregoing groups, reliance must not be placed on ordinary physical signs and clinical symptoms. The means chiefly to be depended on are the tuberculin reaction and roentgen examination. A history of contact is important, but difficult to obtain in school children.

SMITH, Ogden, Utah.

A SURVEY TO DETERMINE THE PREVALENCE OF TUBERCULOUS INFECTION IN SCHOOL CHILDREN. H. W. HETHERINGTON, F. MAURICE MCPHEDRAN, H. R. M. LANDIS and EUGENE L. OPIE, Am. Rev. Tuberc. **20**:421 (Oct.) 1929.

Tuberculin tests of school children of Philadelphia show that 37.7 per cent are infected with tuberculosis at the age of 5 years, and 90.2 per cent at the age of 18 years. The intracutaneous tuberculin test is the only accurate method of determining the incidence of tuberculous infection in apparently healthy children. American born children of Italian parentage show a low incidence of tuberculous infection. In Jewish children positive reactions occurred with approximately the same frequency as in other children.

Pulmonary tuberculosis with symptoms and physical signs was found in 0.5 per cent of school children; it was more frequent in high school children. Latent apical tuberculosis, often the precursor of the adult type of pulmonary tuberculosis, was found in 1 per cent of adolescent children, and more frequently in girls than in boys. Latent tuberculous infiltration of the lung of the childhood type was found in more than 1 per cent of the children. This lesion may be the precursor of grave disease. A latent tuberculous focus in the lungs and tracheobronchial lymph nodes was found in more than 10 per cent of the children. It may be the precursor of pulmonary tuberculosis. Its significance is determined by the size of the lesion, the activity of the tuberculin reaction, continued exposure to open tuberculosis, associated changes in the lung substance and the age of the child.

Pulmonary tuberculosis, recognized by roentgenologic examination, together with symptoms and physical signs, is found more than twice as often in adolescent girls as in boys of the same age. It was found approximately four times more frequently in colored than in white children of high school age.

The evidence obtained suggests that tuberculous infection may spread within schools, but under the existing system of medical school inspection this seldom occurs.

SMITH, Ogden, Utah.

THE DIAGNOSIS AND CLASSIFICATION OF PULMONARY TUBERCULOSIS IN CHILDHOOD AND ADOLESCENCE. F. MAURICE MCPHEDRAN, Am. Rev. Tuberc. **20**:532 (Oct.) 1929.

The apparent sudden onset of acute tuberculosis in children is usually preceded by a period of months or even years for the development of a latent lesion. If lesions are discovered while latent, treatment may be given so that clinical disease is prevented. The diagnosis and supervision of the course of tuberculosis in children depend largely on the roentgenograph. The forms and characteristics of the tuberculous lesions of the lungs and pulmonary lymph nodes and of certain infectious nontuberculous pulmonary infiltrations are summarized in the following outline. It is based on roentgenographic appearances because these are often the sole evidence of an anatomic lesion and almost without exception reveal any lesion that is clinically significant.

Parenchymal lesions that are characteristic of childhood are:

1. Focal tuberculosis: a caseous or calcified nodule. Roentgen examination reveals an isolated, sharply defined subpleural density, often obscured by dense structures. The tuberculin reaction may be negative, with obsolete calcified lesions.

2. Tuberculous consolidation of a lobe or wedge, progressive or unstable. Calcified spots remain if it clears. Roentgenograms show a lobular or roughly wedge-shaped mass that increases or fluctuates in extent or that excavates. There is a positive reaction to 0.01 mg. of old tuberculin.

3. Tuberculous consolidation of a lobe or wedge, retrogressive and benign. Few strands remain when it clears. Roentgenograms show a homogeneous irregular wedge, which is commonly most dense anteriorly (oblique view). The maximum density and extent are seen at the onset. The condition clears slowly, starting in the axilla. There is a positive reaction to 0.01 mg. of old tuberculin.

4. The diffuse childhood type of tuberculous infiltration. Confluent bronchopneumonia is the serious lesion of this type; it often precedes miliary tuberculosis. Roentgen examination reveals spots, strands or both, denser toward the pleura in tangential views, and indolent lesions, strandlike and unilateral. Progressive lesions show confluent spots. There is a positive reaction to 0.01 mg. of old tuberculin.

5. Miliary tuberculosis. Roentgenograms disclose a universal soft mottling. The tuberculin reaction is usually negative in terminal stages.

Tracheobronchial lesions include: 1. Tuberculosis of the tracheobronchial lymph nodes, which are uncalcified. They are demonstrable only when massive. Roentgenograms show large convex masses that project from the hilus or the mediastinum into the parenchyma. There is a positive reaction to 0.01 mg. of old tuberculin; a negative reaction is rare. 2. Tuberculosis of the tracheobronchial lymph nodes, which are calcified. Roentgenograms reveal granular, stippled or irregular dense shadows on the shadow of the hilus; these are shown by an oblique shadow in the mediastinum and are often enormous without a history of illness. There is a positive reaction to 0.01 mg. of old tuberculin. If the reaction to 0.1 mg. is repeatedly negative, the lesion is probably obsolete.

In the apical, adult type of infiltration in children and adolescents, roentgen examination reveals spots, spots and strands, wedges or irregular masses, based on the apical pleura; these are often most easily demonstrable below the third or 4th rib posterolaterally. There is a positive reaction to 0.01 mg. of old tuberculin. The reaction to 0.01 mg. is sometimes weak, even with a developing lesion. This type of lesion is nontuberculous.

In chronic infectious, nontuberculous pulmonary lesions, roentgenograms disclose irregular densities which may coalesce into a cloud on the heart or the diaphragm; if discrete, they may simulate beading on the vessels, which are prominent or distorted. The lesions occur chiefly on the left side, but are often bilateral. They are found mostly in girls. The tuberculin reaction is negative in infants and young children. If negative or weak at any age, it is of great value in differentiation.

SMITH, Ogden, Utah.

EARLY DIAGNOSIS AND EARLY TREATMENT OF PULMONARY TUBERCULOSIS IN CHILDREN: PULMONARY VENTILATION. J. EPSTEIN, Arch. Pediat. **46**:239 (April) 1929.

Cough, loss of weight, fever, accelerated pulse, anemia, fatigue, pain in the chest, hoarseness, neuropsychic disorders or skin manifestations call for a consideration of tuberculosis. Hemoptysis rarely occurs in tuberculosis in children. Night sweats are common to many other diseases. The following abnormalities are suggestive of tuberculosis in children; the shape and deviation in the size and shape of the chest not due to rickets, chronic heart disease or other deforming disorders, persistent increase in fremitus limited to the upper pulmonary region, dulness on percussion, weak, wavy or harsh respiratory sounds, abnormalities in duration, pitch, continuity or quality of respiration, and persistent râles, especially in the upper third of the lung. Diagnosis should be made on the basis of symptoms rather than physical signs. Besides the usual treatment, pulmonary ventilation by graduated exercises is stressed.

WILSON, Norfolk, Va.

EXPOSURE AND TUBERCULOUS MENINGITIS. ARTHUR I. BLAU, Arch. Pediat. **46**:249 (April) 1929.

One hundred and ten cases of tuberculous meningitis were studied which were distributed in the major hospitals in New York. In twenty-two there was a definite history of active tuberculosis in the household; in five the evidence was strong that a member of the family was suffering from active tuberculosis, a total of approximately 25 per cent giving a history of exposure. Symptoms and signs of the disease do not manifest themselves before a period of from four months to a year or more after exposure. Prolonged exposure is not necessary for the development of the disease. The prompt removal of a tuberculous individual from contact with children warrants serious consideration by the health authorities.

WILSON, Norfolk, Va.

PROF. LANGER'S METHOD OF VACCINATION AGAINST TUBERCULOSIS: REVIEW OF THE RECENT PROGRESS MADE IN GERMANY IN VACCINATING INFANTS WITH DEAD TUBERCLE BACILLI. B. M. GASUL, Arch. Pediat. **46**:459 (July) 1929.

Vaccination with dead tubercle bacilli has been undertaken by Langer and others using Langer's vaccine. Positive tuberculin reactions are obtained in from twenty days to five months.

WILSON, Norfolk, Va.

PULMONARY TUBERCULOSIS IN INFANTS AND YOUNG CHILDREN: ITS CLINICAL DIAGNOSIS. W. M. HAPP, California & West. Med. **31**:271 (Oct.) 1929.

The symptomatology of pulmonary tuberculosis in infants and young children is discussed. It is a common infection and with careful study may be diagnosed early. Attention is called to the differences between tuberculosis of the lungs in children and in adults. The prognosis depends on the extent of the disease at the time the infant or child is removed from its contact. The latter step is the most important single item in the treatment. A classification of pulmonary infection in infants and young children is given.

DICKEY, San Francisco.

IMMUNIZATION AGAINST TUBERCULOSIS BY BACILLUS CALMETTE-GUÉRIN (B.C.G.). GERALD B. WEBB, J. A. M. A. **93**:1459 (Nov. 9) 1929.

It is the opinion of the author after careful study of the literature and after his own investigations and experiments that B.C.G. should be given infants born of parents with open pulmonary tuberculosis. When further proof of the harmlessness and efficiency of the vaccine is at hand it may be found that all new-born infants should be so vaccinated.

BONAR, Salt Lake City.

TUBERCULOSIS IN CHILDREN. HORTON CASPARIS, J. A. M. A. **93**:1639 (Nov. 23) 1929.

The method of attacking tuberculosis in children at the Vanderbilt Hospital consists primarily of finding tuberculosis in children in the infectious stage and preventing the development of active disease. The routine test has been the intracutaneous injection of 0.1 mg. of old tuberculin. When a positive test is obtained the history, physical examination and roentgenograms are used to determine the tuberculous involvement. Treatment for active tuberculosis is much the same as it is in adults. The children in the infectious or symptomatic stage are considered potentially tuberculous and are cared for in such a way as to prevent their infection developing into active disease. These measures consist of hygienic and nutritional care and standard preventative inoculations. It was surprising how often tuberculosis was discovered in other children of the same family after the disease had been found in one child. Most of the tuberculosis was found in the infection stage, and was kept inactive with relatively little effort. Such children

are the forerunners of much of the future tuberculosis, and keeping the disease inactive at this time will reduce the incidence of tuberculosis not only in children but also in adults.

BONAR, Salt Lake City.

CHILD CONTACT WITH TUBERCULOSIS. SAMUEL G. HENRICKE, Northwest Med. **28**:467 (Oct.) 1929.

Of 300 children giving a definite history of contact, 216 or 72 per cent reacted to the intracutaneous test. Tests were made at weekly intervals; 0.1 cc. each of a 1:10,000, a 1:1,000, a 1:100 and a 1:10 solution of old tuberculin in normal saline was used successfully. Of 100 children with no contact with tuberculosis, 22 per cent gave positive reactions. This calls attention to the need for early treatment of child contacts.

SCOTT, Philadelphia.

ANTHRAX IN A FIFTEEN MONTHS OLD BABY. ALBERT E. HODGSON, Brit. M. J. **2**:667 (Oct. 12) 1929.

The infant, whose father worked in a tannery, had a typical malignant pustule on the forearm. She was treated with intramuscular injections of anti-anthrax serum. The lesion was not excised, and recovery was prompt. The author was unable to find on record a case of anthrax in so young a patient.

RATTNER, Chicago.

THE TREATMENT OF EXPERIMENTAL TUBERCULOSIS BY CALCIUM ADMINISTRATION. J. CLIFFORD HOYLE, Quart. J. Med. **22**:451 (April) 1929.

The author determined the effect of calcium administered intravenously, on the course of experimentally produced bovine tuberculosis in rabbits. Each of fourteen animals received intraperitoneal injections of 0.001 mg. of a fourteen day-old serum culture of a virulent bovine strain of *Bacillus tuberculosis*. Eight rabbits served as controls, while each of the remaining six received daily injections of 5 mg. of calcium per kilogram of body weight.

Observations on the weight, length of survival after inoculation and post-mortem examination were made. The average length of survival after inoculation in the control group was fifty days, and in the treated, forty-six days. The results showed that treatment by the intravenous injection of calcium had no effect in prolonging the course or in modifying the extent or character of the disease. The author concludes that experimental evidence is lacking to suggest that calcium exerts a direct therapeutic action on the course of the disease.

A review of the literature concerning clinical and experimental application therapy in tuberculosis is given.

BRADFORD, Rochester, N. Y.

PREVENTIVE VACCINATION FOR TUBERCULOSIS BY SUBCUTANEOUS INJECTIONS OF B.C.G. J. HEIMBECK, Presse méd. **37**:1391 (Oct. 26) 1929.

Since 1926 subcutaneous vaccination with B.C.G. has been a routine procedure at the Oslo hospital. There have been no accidents or troubles of any kind, and its employment has been highly satisfactory.

SANFORD, Chicago.

ORAL ADMINISTRATION OF B.C.G. FOR CHILDREN OLDER THAN THE NEW-BORN. M. SCARZELLA, Riv. di clin. pediat. **27**:731 (Oct.) 1929.

Six children, between 8 months and 10 years of age and free from tuberculosis, were given 2 cg. of B.C.G. by mouth, i. e., double the amount usually given to new-born infants, as prophylaxis against tuberculosis.

In three of the thirteen observations, organisms resembling B.C.G. were found circulating in the blood three hours after the culture was given. These organisms were acid fast, but could not be grown by culture nor made to produce

lesions in guinea-pigs. In eight of fifteen observations, acid-fast organisms were found in the urine within twenty-four hours after the B.C.G. cultures were taken.

The author concludes that the intestinal mucosa of the child who has passed the age of the new-born is sometimes permeable to B.C.G.; this passage of the bacteria is not certain or frequent enough to warrant the attempt to vaccinate older children in this way.

HIGGINS, Boston.

TUBERCULOUS MENINGITIS OF SIXTY-SIX DAYS' DURATION. MARTÍNEZ VARGAS, Med. de los Niños **30**:257 (Sept.) 1929.

A boy, aged 5 months, became ill with dyspnea, cyanosis and vomiting which was cerebral in character. These symptoms came on abruptly with a strident cry and a high temperature. The following day he developed rigidity of the neck, Kernig's sign, unequal pupils, strabismus and convulsions. Examination of the spinal fluid revealed a high lymphocyte count, but no tubercle bacilli or other organisms. He died on the sixty-sixth day of his illness. Autopsy disclosed tubercles disseminated throughout the meninges and choroid plexus, and tuberculous lesions of the lung and the pleura.

DWYER, Kansas City, Mo.

THE TECHNIC OF THE PERCUTANEOUS TUBERCULIN REACTION OF MORO. K. HILLE, Arch. f. Kinderh. **88**:14 (July 12) 1929.

The highest number of positive reactions are found with the Mantoux method. When used with ether, the Moro procedure gives an 85 per cent positive reaction, while without ether it gives only a 65 per cent positive reaction. The Pirquet method gives a 42 per cent positive reaction. The author recommends the Moro test as the most practical for general use.

SANFORD, Chicago.

THE VALUE OF B.C.G. VACCINATION AGAINST TUBERCULOSIS. H. BUSCHMANN, Arch. f. Kinderh. **88**:241 (Oct. 25) 1929.

Buschmann states that B.C.G. vaccine does not cause tuberculosis in weak and unhealthy guinea-pigs, and does not cause a further decrease in their vitality. In weak and unhealthy guinea-pigs that have been vaccinated with B.C.G., an inoculation with virulent tubercle bacilli does not produce tuberculosis, whereas in unhealthy control animals it produces a severe, rapidly fatal form of the disease.

SANFORD, Chicago.

TOXIC EXANTHEM DUE TO TUBERCULOSIS. G. HALFER, Arch. f. Kinderh. **88**: 261 (Oct. 25) 1929.

Two children, aged 5 and 4 years, had a generalized scarlet fever-like rash covering the entire body. They had a slight fever at this time. Within a month both died of miliary tuberculosis. The author believes that the rash was due to an allergic reaction to a tuberculous endotoxin.

SANFORD, Chicago.

NOTES FROM A CONSULTANT'S PRACTICE. BEUMER, Deutsche med. Wchnschr. **55**: 1257 (July 26) 1929.

The failure to make a correct diagnosis in an obscure case is more often due to carelessness in examination and overlooking an important symptom than to actual lack of knowledge. This is especially true in pediatric practice, because the history may not call attention to the outstanding symptom. As a case in point the author cites that of a girl, aged 7, in whom the most obvious symptom was extreme jaundice, preceded by loss of hair and weakness. The failure to make a correct diagnosis was due to incomplete examination. The consultant found a wide ring of syphilitic condylomas around the anus.

In a second case, a boy, aged 5, with a high, septic temperature, developed extreme jaundice after two weeks of illness. In this case, which presented the

picture of agranulocytosis, the key to the correct diagnosis was again found in careful inspection. There was definite asymmetry of the face, with swelling on the left side. Inspection of the mouth showed an abscessed molar which when extracted discharged free pus. Complete recovery occurred in ten days.

SCHERER, Duluth, Minn.

THE RÔLE OF TUBERCULOUS BONE DISEASE IN THE COMMUNITY. OTTO WIESE, Gsndhtsfürs. f. d. Kindesalt. **4**:445 (Nov.) 1929.

Wiese discusses the statistics of the various tuberculous diseases of the bone. He describes the social service agencies in Germany which deal with this problem and adds his own suggestions.

REICHLE, Cleveland.

INOCULATION AGAINST TUBERCULOSIS WITH B.C.G. M. R. HEYNSIUS VAN DEN BERG, Nederl. Tijdschr. v. Geneesk. **2**:5255 (Nov. 9) 1929.

The author gives a survey of the state of the problem of preventive inoculation against tuberculosis with B.C.G. The general impression as given in communications about this inoculation since the original communication of Calmette is that the application of B.C.G. confers a certain protection against tuberculosis. The same opinion has been observed by the author in Amsterdam. This protection is only relative, as may be deduced from the fact that in nearly all communications some instances of death from tuberculosis are reported though the mortality was low, and further from the fact that the author, like some other investigators, saw some small deviations in the roentgenograms which might be regarded as suggestive.

VAN CREVELD, Amsterdam, Holland.

Internal Diseases

THE ELECTROCARDIOGRAM IN PERICARDIAL EFFUSION: I. CLINICAL. R. W. SCOTT, H. S. FEIL and L. N. KATZ, Am. Heart J. **5**:68 (Oct.) 1929.

Two cases are reported: one of acute pericardial effusion and the other of purulent pericarditis.

In the first case, the patient had a syphilitic infection twenty-seven years previous to examination, and was admitted to the hospital after having had repeated attacks of paroxysmal substernal pains for one month. For two days the pains were severe and respiratory distress was prominent. Paracentesis was done and bloody fluid was found. The cardiogram showed typical monophasic R-T deviation characteristic of myocardial infection, with only one exception: the S-T segment was above the iso-electric level in all leads, while in clinical curves the S-T segment is usually oppositely directed in leads 1 and 3.

In the second case, not as characteristic a change was noticed; possibly the myocardial damage due to the infection was partly responsible for the deviation from the normal.

The changes are ascribed to increased hydrostatic pressure in the pericardial sac, probably causing anoxemia of the heart muscle.

MANNING, Santa Barbara, Calif.

THE ELECTROCARDIOGRAM IN PERICARDIAL EFFUSION: II. EXPERIMENTAL. L. N. KATZ, H. S. FEIL and R. W. SCOTT, Am. Heart J. **5**:77 (Oct.) 1929.

An experiment was performed with the view of proving the results obtained in the preceding observations.

Dogs were anesthetized with morphine and barbital, artificial respiration was started and a cannula was inserted into the pericardiac sac through the chest wall. A certain amount of oil or of isotonic saline solutions was injected and electrocardiograms were taken. The electrocardiographic changes were found to be of three types:

1. The R-T wave resembled that found in the clinical cases reported (this was found in four experiments on four animals, out of a total of fifteen experiments on six dogs). The Q R S became smaller; the S-T segment was not shortened but was raised above the iso-electric level and was followed by a small inverted or occasionally an upright T wave.

2. R-T deviations were shown in leads 1 and 3. The Q R S complex was smaller; the S-T interval was shortened; the iso-electric level usually remained unchanged or slightly positive; the T wave became upright, broad, tall and round.

3. The Q R S complex was smaller in leads 2 and 3; the S-T interval was not shortened but became positive in the different leads.

The changes in electrocardiograms were thought to be caused by anoxemia of the heart muscle which was more marked in the left ventricle, leading to block and to decreased electric response.

MANNING, Santa Barbara, Calif.

A CASE OF SINUS ARRHYTHMIA, WITH PULSE-SLOWING ACCOMPANYING EACH SECOND RESPIRATION. FRANCIS C. WOOD, Am. Heart J. **5**:104 (Oct.) 1929.

The author reports the case of a medical student who suffered from chronic enlargement of the thyroid and acute bronchopneumonia at the time of entry to the hospital. During convalescence, the patient became nervous; the basal metabolism was found to be plus 14, and rose gradually to plus 40 six months afterwards. The patient was then kept under observation for five months. The condition was considered as normal, as no changes were recorded during that period.

The type of arrhythmia seems to belong to the "vagal" group in which expansion of the chest causes a vagus stimulation inhibiting the sino-auricular node. The occurrence of arrhythmia during expiration seems to indicate that an extrathoracic stimulation affecting directly the vagus center was also at play.

The 2 to 1 relation still remains an inexplicable feature of the case; however, it suggests some cumulative factor, not strong enough to be effective with each quiet respiration.

MANNING, Santa Barbara, Calif.

ERYTHROBLASTEMIA OF INFANTS (VON JAKSCH'S DISEASE). B. R. WHITCHER, Am. J. M. Sc. **179**:236 (Feb.) 1930.

The author gives in detail three case reports of erythroblastemia of infants (von Jaksch's disease), in which the striking features are the unusually large number of nucleated red cells, at times outnumbering the leukocytes, and the uniformly relatively rapid fatal outcome. The author was unable to determine the etiology but he suggests that the digestive function may be the underlying cause of this sort of anemia, and that a marked increase of leukocytes in the blood might be the result of gastro-intestinal irritation.

HENSKE, Omaha.

CONGENITAL PYLORIC OBSTRUCTION: ETIOLOGY, PROPHYLAXIS AND TREATMENT. C. ULYSSES MOORE, JESSIE L. BRODIE, H. G. DENNIS and R. B. HOPE, Arch. Pediat. **46**:416 (July) 1929.

The history and theories as to the etiology of congenital pyloric obstruction are reviewed. While studying the various effects of a lack of the vitamin B complex in albino rats there was found, especially in the young of the second generation, a clinical picture characterized by an enlarged and very firm abdomen, accompanied by extreme emaciation. At autopsy the stomach was found to be enlarged to several times its normal size and to be packed with milk curd; on extrusion, the curd made a perfect cast of the mucosa. As rodents cannot vomit there had been repeated packing of each day's nursing into the distended stomach. An examination of the vagus nerves showed myelin degeneration, an observation typical of beriberi. In cases in which the gastric distention was mild or was cured by atropine, the animals later developed polyneuritis.

Pyloric obstruction appears, therefore, to be one manifestation of vitamin B deficiency, with resulting defective myelinogeny. Pyloric obstruction was obtained in 1.2 per cent of the young of the first generation, and in 22 per cent of the second generation of rats fed on a diet deficient in vitamin B.

The usual atropine medication is employed; also thick cereal and refeeding. In addition, 1.8 Gm. of a desiccated yeast is given with each feeding. Blood transfusion is occasionally employed. The pregnant mother is given 3 Gm. of desiccated yeast daily. As a prophylactic the authors feel that every pregnant woman should be given desiccated yeast throughout pregnancy and lactation, and that the baby should receive it from the beginning.

WILSON, Norfolk, Va.

CONGENITAL LYMPHANGIECTATIC EDEMA. JOSEPH H. MARCUS, Arch. Pediat. **46**:507 (Aug.) 1929.

A case is reported in a girl, aged 19 months, whose brothers and sisters were normal and who presented no familial history of the disease. A symmetrical enlargement of the upper and lower extremities of the left side to the extent of twice the size of their fellows was noted. The enlargement also included the tissues in the region of the external genitalia. Little is found in the literature concerning this disease. The etiology is obscure. The condition seems to be principally a hyperplasia of the subcutaneous tissues, with special involvement of the lymphatics. Treatment is unsatisfactory and results have been disappointing. Dr. Béla Schick, in discussing the case, stated that he leaned toward surgical treatment with excision of portions of the redundant tissue at intervals.

WILSON, Norfolk, Va.

SPLENECTOMY IN ACUTE THROMBOCYTOPENIA PURPURA HEMORRHAGICA. H. R. LITCHFIELD, Arch. Pediat. **46**:511 (Aug.) 1929.

A case is reported in a girl aged 6 years. Repeated blood transfusions failed to keep the platelet count up, and splenectomy was resorted to. She made an uneventful recovery. Splenectomy has been reported in about thirty cases. It is usually not advisable in the acute stage; however, in the case reported, it probably saved the patient's life. The author advises splenectomy when palliative measures have failed and then only in primary purpura, never in the secondary type.

WILSON, Norfolk, Va.

GASTRIC ULCER IN A GIRL THREE YEARS OLD. MAUD LOEBER, Arch. Pediat. **46**:578 (Sept.) 1929.

Standard textbooks and the current medical journals are reviewed, and a case in a white girl aged 3 years is reported. Vomiting began on the third day, and the vomitus contained blood. Roentgen examination showed an ulcer on the lesser curvature just below the entrance of the esophagus. A modified Sippy diet was given, and at the time of the report there had been no return of symptoms. The author concludes that gastric ulcer in childhood is frequently overlooked unless active hematemesis occurs. All cases of digestive upsets should receive careful consideration from this angle. Local foci of infection and acidosis of undetermined etiology should be looked on with suspicion as probable factors.

WILSON, Norfolk, Va.

ULCERATIVE COLITIS IN CHILDREN. LEONARD H. GREENBAUM, Arch. Pediat. **46**:584 (Sept.) 1929.

A gram-positive diplococcus which gave the morphologic and cultural characteristics of Bargen's diplococcus was isolated. A vaccine was made from the organism and given to the patient, a boy aged 3½ years. Twenty-two injections were given during three months. Additional treatment consisted of a high caloric,

high vitamin, low residue diet, an occasional colonic washing during the early part of the treatment and a maximum amount of sunshine, fresh air and regulated exercise. Improvement was noted as early as the end of the second week. At the time of the report, eight months had elapsed without an attack and without abnormal constituents showing in the stools.

WILSON, Norfolk, Va.

CHRONIC PYURIA IN CHILDREN. ALBERT M. MEADS, California & West. Med. **31**:405 (Dec.) 1929.

Fourteen cases of chronic pyuria are reported, ten being in children. All of the cases in adults and seven of those in children were associated with congenital defects in the urinary tract. The importance of careful cystoscopic investigation in all cases of chronic pyuria is stressed.

DICKEY, San Francisco.

ACUTE UPPER RESPIRATORY TRACT INFECTIONS IN CHILDREN. CLIFFORD SWEET, California & West. Med. **32**:74 (Feb.) 1930.

Attention is called to the common practice among both laymen and physicians of ascribing acute illnesses in children to the ingestion of improper food or to an infection of the gastro-intestinal tract. Such symptoms as fever, vomiting, diarrhea, convulsions and abdominal pain are common in acute infections of the upper respiratory tract, more so in gastro-intestinal disease. In children, the latter is less apt to explain the symptoms than is respiratory disease. Careful physical examination, always performed before the prescribing of any therapy, will enable the physician to practice medicine more successfully.

DICKEY, San Francisco.

INCIDENCE OF HEART DISEASE IN SCHOOL CHILDREN. JACOB M. CAHAN, J. A. M. A. **92**:1576 (May 11) 1929.

The author found organic heart disease in 0.91 per cent of 10,333 children in ten public schools. There was a slightly lower incidence in boys and younger pupils. Mitral stenosis was the most frequent valvular lesion found; it occurred in fifty-three of ninety-four children with heart disease. In fourteen of these, mitral insufficiency was also detected.

BONAR, Salt Lake City.

PRACTICAL SUGGESTIONS RELATING TO URINARY FINDINGS IN EARLY LIFE. JAMES D. LOVE, J. Florida M. A. **16**:221 (Nov.) 1929.

This is a brief consideration of pyuria, orthostatic albuminuria and the ammoniacal diaper; also of pyuria, often regarded as pyelitis and treated as such. The author advises hesitation in the diagnosis of pyuria as pyelitis if the urine is persistently alkaline in an untreated patient. Confusing conditions associated with pyuria are cystitis, urethritis, tuberculous kidney and congenital or acquired anomalies of the urinary tract. In the female patient, a catheterized specimen of urine is required for satisfactory examination. In the male patient, urethral and subprepucial discharges often account for pyuria. For purposes of diagnosis and to note the progress of the case a shaken specimen of urine rather than one that has been centrifugalized should be used. The etiology, diagnosis and treatment for orthostatic albuminuria and the ammoniacal diaper are briefly considered.

LOVE, Jacksonville, Fla.

THE ROENTGENOLOGIC DIAGNOSIS OF CARDIAC DISEASES. LEO G. RIGLER, Minnesota Med. **12**:25 (Jan.) 1929.

The roentgen method is the most accurate means of determining the exact size and shape of the heart and may thus be the deciding factor in making a positive diagnosis of disease of the heart. Visualization of the esophagus may

also assist in the diagnosis as it may be compressed and displaced by enlargement of the left auricle.

Disease of the mitral valves produces essentially three roentgenographic observations: (1) a distinct increase in the transverse diameter of the heart; (2) a marked convexity of the left border, due to enlargement of the conus pulmonalis, and (3) a posterior displacement and compression of the esophagus in that portion which is in contact with the left auricle.

Thyroid insufficiency may produce a flask-shaped heart which rapidly decreases in size on thyroid medication. Toxic conditions of the myocardium produce the same type of heart. Chronic conditions of the lung may produce a cardiac enlargement the shape of which is similar to the mitral heart but without esophageal displacement.

HUENEKENS, Minneapolis.

THE PREVENTION OF HEART DISEASE. FREDERICK A. WILLIUS, Minnesota Med. **12**:355 (June) 1929.

After a discussion of some general measures in the prevention of heart disease, Willius has the following to say about foci of infection: The relationship of foci of infection to rheumatic fever is still debatable, owing in part again to the unreliability of available statistics. Numerous instances of recurrent rheumatic fever have been observed after tonsillectomy, and the initial attack has been known to occur after tonsillectomy; yet this does not justify the conclusion that eradication of foci is not without scientific merit. Statistics on the relation of tonsillectomy to the occurrence or recurrence of rheumatic fever must be questioned, as the patients have been operated on by various surgeons and the matter of thoroughness of removal must be taken into account. The trend of modern bacteriologic thought makes one reluctant to minimize the value of eradicating obvious foci of infection.

HUENEKENS, Minneapolis.

GLYCOSURIA IN CHILDREN. JOHN G. YOUNG, Texas State J. Med. **25**:478 (Nov.) 1929.

Glycosuria is defined as the condition due to the presence of dextrose, and dextrose only, in the urine. Emphasis is placed on the physician's being positive of a correct laboratory observation.

The first type discussed is alimentary glycosuria, i. e., a true glycosuria due, not to kidney or pancreatic deficiency, but to the patient's over-indulgence in sugar during a short period. This high sugar intake loads the blood stream so that some is eliminated in the urine. This point of elimination is called the "threshold of dextrose tolerance." Variations in the threshold may normally be from 0.12 to 0.18. Treatment is merely one of control of the ingestion of excessive amounts of sugar.

The author notes that this same type of glycosuria may occur after therapeutic administration of dextrose intravenously or subcutaneously in the treatment for acidosis.

The type of glycosuria that is diagnosed as true diabetes mellitus is differentiated by additional signs and symptoms, such as polydypsia, polyphagia, polyuria, loss of weight, and weakness. Only a test for dextrose tolerance with an examination of the blood chemistry will make a definite diagnosis of diabetes mellitus.

The author discusses the hopeful prognosis for the child with diabetes, the importance of corrected dosage and the hope of increased carbohydrate tolerance.

The third type, renal glycosuria or renal diabetes, is next discussed, with a report of four cases. Renal diabetes is characterized by a low urinary threshold and by no excessive concentration of dextrose in the blood.

The danger is in impeding nutritional progress as a result of loss of dextrose in the urine which by right belongs to the body tissues.

The treatment outlined is: the frequent feeding of small amounts of carbohydrate with a larger amount of protein than is normally contained in the diet of children; the free ingestion of milk and eggs, with from four to seven small meals daily.

MOORE, Dallas, Texas.

AURICULAR FIBRILLATION IN CHILDREN. HAROLD COOKSON, Lancet **2**:1139 (Nov. 30) 1929.

In fifteen years (from 1913 to 1928) auricular fibrillation was diagnosed in 1,164 patients admitted to the London Hospital; females were twice as numerous as males. Those 17 years of age and under were considered as "children"; there were thirty of these, and five others were added from other sources. The ratio was three girls to two boys. The youngest was 12 years of age. The diagnosis of fibrillation rests on graphic proof in only ten cases.

In all cases the following criteria were satisfied: (*a*) rapid and very irregular heart, (*b*) persistent irregularity and (*c*) a response to digitalis by considerable slowing. Rheumatic disease of the heart was the basis of the arrhythmia in all cases.

Clinically the diagnosis of mitral stenosis was made in twenty-five of the thirty-five cases, four of these having aortic incompetence in addition; in two the aortic valve alone was affected.

Established fibrillation in young people under 17 years of age must be regarded as a serious condition. In twenty-three cases the average duration of life after the onset of the abnormal rhythm was ten months.

LANGMANN, New York.

ASTHMA IN CHILDREN: THE VALUE OF SUGAR IN ITS PREVENTION AND TREATMENT, A. ARNOLD OSMAN, Lancet **2**:1187 (Dec. 7) 1929.

From the author's observation, it seems that an increased allowance of sugar as such (i. e., not as starchy foods) in the diet alone was sufficient to prevent recurrence of asthma in four children over a considerable period of time. The treatment consisted of giving 3 drachms (11.6 Gm.) of powdered dextrose three times a day, between meals; while extra sugar and "sweets" were administered to debilitated children.

LANGMANN, New York.

THE PULSE-RATE AND RANGE IN HEALTH AND DISEASE DURING CHILDHOOD. G. A. SUTHERLAND and JOHN MCMICHAEL, Quart. J. Med. **22**:519 (April) 1929.

In healthy children, the pulse rate shows a diurnal variation, the afternoon rate being, on an average, 34 beats per minute faster than the early morning rate during sleep. According to the authors, this variation is due to nervous influences and is especially marked in children of nervous excitable temperament. Pyrexial conditions cause the diurnal variation to disappear. It is replaced by a pulse rate dependent on the rise in temperature, each degree of fever (F.) producing a change of about 10 beats.

A rapid pulse may be the only sign of activity in a case of rheumatic carditis. It is therefore important to determine whether a rapid pulse in a rheumatic child is physiologic or pathologic. The authors point out that when the tachycardia is due to a definite organic rheumatic carditis the pulse rate continues to be rapid day and night. The return of the diurnal variation is a healthy sign.

The authors present the results of observations on the pulse rate of normal children, those suffering from pneumonia and from rheumatic carditis and the normal pulse rate modified by atropine. The age of the patients varied from 2 to 12 years.

BRADFORD, Rochester, N. Y.

SUPRARENAL VIRILISM (WITH A REPORT OF TWO CASES). A. DINGWALL FORDYCE; Pathologic Notes by W. Howel Evans, Quart J. Med. **22**:557 (July) 1929.

Complete reports of two cases of suprarenal virilism are given. The patients, a boy and a girl, each aged 2 years, were not related. The other children in

each family were normal. An encapsulated cortical tumor involving the left suprarenal body was removed at operation in each case. The boy died eight hours after operation while the girl survived. Pathologically, each tumor was a typical cortical hypernephroma. In the case of the boy, necropsy revealed metastases to the liver and brain. The pineal body, thyroid, parathyroids, thymus and pituitary were normal.

In each case, the salient clinical features were: changes in the secondary sex characters, hypertrophy of the genitalia and the occurrence of pubic hair. The features were coarse. In one case the voice was of a very deep tone.

The authors point out the fact that tumors of the gonads and of the pineal body also produce hypergenitalism with marked changes in the secondary sex characters. The literature is discussed and excellent photographs and photomicrographs are presented.

BRADFORD, Rochester, N. Y.

CLINICAL AND ANATOMIC STUDY OF LIPOIDAL NEPHROSIS. PAUL GOVAERTS and R. CORDIER, Bull. Acad. roy. de méd. de Belgique **8**:510, 1928.

Nephrosis cannot be explained by an isolated degeneration of the kidney; it is due to grave metabolic disturbances of the body as a whole. This is indicated by a diminution of the osmotic pressure of the blood proteins, on account of hypoalbuminosis. Hence a diet rich in proteins is recommended.

KUGELMASS, New York.

PATHOGENESIS OF THE ANEMIAS OF INFANCY. L. MALDAGUE, Rev. franç. de pédiat. **5**:555 (Oct.) 1929.

That which is said to characterize the infant in regard to anemia is (1) a diet poor in iron and vitamines, (2) frequently a syphilitic taint, and (3) gastrointestinal disturbances, which affect hematopoiesis by interfering with the absorption of iron and vitamines and the more common elements necessary to the formation of the blood. The author feels that each of these causes may engender any of the clinical aspects of anemia from the simple chlorotic type to the anemia of von Jaksch and even to the pernicious type, provided it has operated for sufficiently long time. Three case reports are given which seem to bear out the author's contention that the appearance of nucleated red cells in the blood is not coincident with the greatest activity of the bone-marrow, but is evidence of interference with the proper maturation of the red cells.

LESLIE, Evanston, Ill.

PULMONARY MYCOSIS FROM "STERIGMATOCYSTIS NIGRA" IN A BOY AGED SIX YEARS. P. COCCHERI, Riv. di clin. pediat. **27**:749 (Oct.) 1929.

Pure cultures of *Sterigmatocystis nigra* were repeatedly isolated from the sputum of a boy, aged 6, who was ill with bronchiectasis and fibrinous pleurisy. Tuberculosis was ruled out by the clinical course and by animal inoculations. This type of mycelium was found to be pathogenic in the white rat.

HIGGINS, Boston.

PYURIAS IN INFANCY. A. ROMEO LOZANO, Arch. españ. de pediat. **13**:641 (Nov.) 1929.

The author recommends the combination of medical and autogenous vaccine therapy for purulent infections of the urinary tract. The medical treatment is effective in the early period of these conditions. The autogenous vaccine therapy is more effective in the later period and particularly for protracted chronic forms.

SCHLUTZ, Minneapolis.

PYLOROSPASM: EMPTYING OF THE STOMACH AFTER MORE THAN SIX HOURS; CURE WITH MERCURIAL TREATMENT. A. CASAUBÓN, J. R. DELUCCHI and A. MORENO, Arch. latino-am. de pediat. **23**:669 (Sept.) 1929.

The case reported concerns an infant, 38 days of age. No pyloric tumor was observed but the infant showed all the hypertrophic symptoms of pyloric stenosis, such as persistent vomiting, marked peristaltic wave, persistent loss of weight and great dehydration. The complete emptying time of the stomach was often delayed six hours. The infant was born at term and was breast fed. After admission to the hospital, the dietetic regimen was mainly the butter-flour-sugar mixture of Czerny.

Although a specific venereal history was denied, the Wassermann reaction of the mother was found positive. Inunctions with mercurials were immediately begun with the infant, with correspondingly rapid improvement of all symptoms.

The authors believe that congenital syphilis must be considered in the differential diagnosis of these cases.

SCHLUTZ, Minneapolis.

A TYPICAL CASE OF LOBAR PNEUMONIA IN AN INFANT. M. DA ROCHA, JR., Arch. de pediat., Rio de Janeiro **2**:446 (Oct.) 1929.

Da Rocha describes the course by crisis of a typical case of lobar pneumonia of the lower left lobe in a child aged 1 year. His treatment was fresh air, hydrotherapy and forced administration of fluids.

SANFORD, Chicago.

CONGENITAL HYDRONEPHROSIS IN A CHILD AGED 7 YEARS. F. HURTADO, Bol. Soc. cubana de pediat. **1**:561 (Oct.) 1929.

The child had a temperature of 38 C. and a palpable mass in the abdomen. Roentgenograms showed that the colon was pushed aside by a large mass, probably the kidney. Elimination by the Rowntree method was 56 per cent the first hour, and 26 per cent the second. The blood showed 0.002 Gm. of creatine, 0.004 Gm. of uric acid and 0.164 Gm. of cholesterol. An immense hydronephrotic kidney was removed at operation. The child recovered in good condition.

SANFORD, Chicago.

THE ROENTGENOGRAM OF PNEUMONIA IN INFANTS. O. GÖTTCHE, Arch. f. Kinderh. **88**:279 (Oct. 25) 1929.

The author made a systematic roentgen study of ninety cases of pneumonia in infants up to 1 year of age. Fourteen typical cases of lobar and infiltrative pneumonias and bronchopneumonias are reported with roentgenograms. Of particular interest are eight cases of lobar pneumonia in the new-born.

SANFORD, Chicago.

A CASE OF THYMUS HYPERPLASIA. ANNEMARIE LABAND, Monatschr. f. Kinderh. **45**:225 (Nov.) 1929.

The author reports the case of a nursling, aged 2½ months, who was taken acutely ill in the morning and who showed extreme cyanosis and collapse. Respiration was stridorous and dyspneic. Percussion and roentgen examination revealed symptoms suggestive of a thymic condition. The child died, and autopsy showed an enormous thymus.

The writer agrees with Finkelstein that death from a thymic condition is caused by heart failure and not by a respiratory obstruction.

GERSTLEY, Chicago.

CLINICAL AND PATHOLOGIC PICTURE OF THROMBOSIS OF THE SPLENIC VEIN IN CHILDHOOD. ERICH HOLZMANN, Monatschr. f. Kinderh. **45**:294 (Nov.) 1929.

Report of two cases and review of the literature of thrombosis of the splenic vein. In each case the symptoms were ushered in with vomiting of blood, tarry stools, anemia and great swelling of the spleen. One child was 3½ years of age,

and the other 4. In each case the spleen was extirpated. One of the children recovered, and the other one died. Pathologic examination of the spleen gave the picture of Banti's disease. The writer attempts to describe the thrombosis to this condition.

GERSTLEY, Chicago.

THE POSSIBILITY OF INFECTIOUS ORIGIN OF ACUTE LYMPHATIC LEUKEMIA. ELISABETH JUNGBLUTH, Monatschr. f. Kinderh. **45**:323 (Nov.) 1929.

The author reports two cases of acute lymphatic leukemia. The patient in the first case died in three days showing a typically diagnostic blood reaction. On postmortem examination, a streptococcus endocarditis was discovered. The second case gave the clinical picture of a colisepsis with *Bacillus coli* found both in the blood and a metastasis to a joint. Here autopsy showed lymphatic leukemia.

The writer uses these two cases as evidence of the possibility that acute lymphatic leukemia is simply reaction of the blood to a general sepsis.

GERSTLEY, Chicago.

THE ANTIRACHITIC VALUE OF IRRADIATED MILK. H. HENTSCHEL and A. ROSZKOWSKI, München. med. Wchnschr. **76**:1423 (Aug. 23) 1929.

The authors found that fresh milk exposed to ultraviolet rays was not efficacious in the treatment for rickets. Irradiated ergosterol healed cases of rickets which had not responded to treatment with irradiated milk.

BRAHDY, Mt. Vernon, N. Y.

CECAL CARCINOMA IN A 14 YEAR OLD GIRL. D. M. CHAJUTIN, Ztschr. f. Krebsforsch. **29**:389, 1929.

A case of adenocarcinoma of the cecum in a girl, aged 14, is here reported. The diagnosis was made only on histologic examination of autopsy material; the clinical diagnosis was intestinal tuberculosis.

EGGERS, Omaha.

DISTURBANCES IN THE CIRCULATION OF THE LIVER. W. M. DE VRIES, Nederl. tijdschr. v. geneesk. **2**:5326 (Nov. 16) 1929.

In this article some disturbances of the blood supply to the liver are discussed:

1. The occlusion of one of the chief branches of the portal vein. Eight cases of this kind were observed. In seven cases the occlusion was caused by a tumor and only once by thrombosis in a case of vitium cordis. In all cases atrophy of the corresponding half of the liver existed.

2. Hemidegeneration of the liver. This disease has been studied especially by Wassink (1915) and connected with the distribution of the portal blood in the liver. He regarded it as probable, as did Gopher and Dick (*Arch. Surg.* **17**:408 [Sept.] 1928), that there existed a double blood stream in the portal vein, which explained the occurrence of hemidegeneration of the liver in certain abdominal diseases. The condition was found by Wassink in some cases of acute peritonitis and in two cases of enteritis in small children. The author observed forty-six cases of hemidegeneration and in the large majority the explanation of Wassink for the hemidegeneration could be accepted.

3. Occlusion of the stem of the portal vein. Whereas occlusion of one of the chief branches of the portal vein gives rise to atrophy of the corresponding part of the liver, the occlusion of the stem of the portal vein has no bad consequences for the liver. The author illustrates the difference between occlusion of the branch and of the stem of the portal vein.

4. Occlusion of the arteria hepatica. The sudden occlusion of the arteria hepatica propria usually gives rise to necrosis in the whole liver or in that part of the liver corresponding to the occluded branch of the arteria hepatica propria. The occlusion usually follows an operation. Generally insufficient ligation of the

arteria hepatica causes death. However, it is not easy to give an explanation of the necrosis and the subsequent death, a fact which is discussed by the author.

Finally the author explains that as a final result of the hemiatrophy of the liver after occlusion of one of the chief branches of the portal vein and of the necrosis arising after occlusion of one of the chief branches of the arteria hepatica, so-called hypoplasia of a lobe of the liver may arise.

VAN CREVELD, Amsterdam, Holland.

CLINICAL FEATURES OF DIABETES INSIPIDUS IN CHILDHOOD. EMMA J. MEIJERS, Nederl. tijdschr. v. geneesk. **2**:5336 (Nov. 16) 1929.

Four cases of diabetes insipidus are reported in this article. In the etiology of the first case, tuberculosis was probable, and in the second case encephalitis; in the third case no definite etiology could be given and in the fourth case congenital syphilis was the most probable cause. In the last case antisyphilitic treatment met with no success. The development of children with diabetes insipidus is briefly discussed. In the first case the mental and physical development was good. Some newer therapeutic measures recommended in diabetes insipidus (horse-radish and the sniffing of dried hypophyseal extract) were tried in one case, but without success. Finally, the newer conceptions about diabetes insipidus are discussed briefly.

VAN CREVELD, Amsterdam, Holland.

THE SIGNIFICANCE OF LAMBLIA INTESTINALIS IN HUMAN PATHOLOGY. J. M. NOOTHOVEN VAN GOOR, Nederl. tijdschr. v. geneesk. **2**:5557 (Nov. 30) 1929. 1929.

After a survey of the literature on the subject the author describes six cases of his own, one occurring in a girl, aged 4 years, the others in adults. From his observations the author concludes:

1. Vegetative lambliae may be found by duodenal sound in the upper part of the intestine even though lamblia-cysts are not present in the feces.

2. It is not proved as yet that *Lamblia* is pathogenic for the duodenum.

3. In duodenal fluid, which contains *Lambliae,* there are generally no products of inflammation.

4. When a large number of *Lambliae* are found in bile obtained by duodenal sounding, one may not conclude that these flagellated organisms originate from the gallbladder.

5. It is not proved and is highly improbable that *Lamblia intestinalis* causes inflammation of the bile ducts and the gallbladder.

VAN CREVELD, Amsterdam, Holland.

Nervous Diseases

ENCEPHALITIS, MENINGITIS AND MYELITIS: NERVOUS SEQUELAE OF DISEASES OF THE RESPIRATORY TRACT. KATHERINE DODD, Arch. Pediat. **46**:533 (Sept.) 1929.

The literature on encephalitis and other nervous manifestations accompanying or following acute infectious diseases is reviewed. Ford's classification of the nervous complications of measles is given in detail. In type one the symptoms are those of a general toxemia with prompt and complete recovery. In type two there are focal cerebral symptoms. Recovery is slow and incomplete but there is a strong tendency to improvement. Type three comprises hemiplegias and aphasias. In these the spinal fluid is usually normal. Type four consists of paraplegias and spinal cord syndromes. In this group there are two classes: In one there is general involvement of the nervous system with the chief damage to the spinal cord; in the other the spinal cord alone is affected.

Five cases are reported. The first was that of a colored boy, aged 10 years, with a sinus infection, probably of staphylococcus origin, and a complicating

staphylococcus septicemia with osteomyelitis and marked central nervous system symptoms of a toxic character. Except for hyperactive reflexes, recovery was complete at the end of a year. The second case was that of a colored girl, aged 6 years, who had an encephalitis of some type producing aphasia, difficult deglutition and partial paralysis of the extremities. Recovery was almost complete. In case 3, a colored boy, aged 18 months, had a severe infection of the throat, with *Streptococcus hemolyticus*. Meningitis developed on the nineteenth day of his illness, but there was no response to antimeningococcus serum. No organisms were found. This was apparently a case of toxic meningitis secondary to a streptococcic condition of the throat. Case 4 was that of a white boy, aged 7 years, with fever of five weeks' duration; he showed râles in the chest at the end of the third week, when he was admitted to the hospital. The râles disappeared two days later. The spinal fluid showed 2,100 cells, mostly mononuclears, and the globulin was increased. Four days later, the cell count was 110. Four weeks later, the patient was discharged well. The history, the high cell count and the complete recovery were indications against the diagnosis of epidemic encephalitis. In case 5, a colored boy, aged 10, became sore all over and was delirious the day before admission. He was extremely hyperesthetic, but the reflexes were elicited with difficulty. He was discharged well three weeks after admission. This was a case of peripheral neuritis following what was probably an infection of the upper respiratory tract.

It seems probable that nervous complications of acute infections are not exceedingly uncommon, that they are caused by the action of toxins on the blood vessels of the nervous system, with secondary involvement of the nervous tissues, and that their course is more benign than that of most other diseases of the nervous system.

WILSON, Norfolk, Va.

HYPOGLYCEMIA AND THE CONVULSIONS OF EARLY LIFE. J. P. CROZER GRIFFITH, J. A. M. A. **93**:1526 (Nov. 16) 1929.

The author cites four cases which largely confirm the observations of Josephs, to the effect that in convulsions in children there is probably a frequent association between this disorder and the existence of hypoglycemia. Whether this is an etiologic relationship cannot be determined, but these investigations show that a low blood sugar may exist without the occurrence of convulsions. In the first case, which was most carefully studied, the rapidity of improvement on four different occasions and the rapid response seen in the second case, seemed to justify the conclusion that the causative relationship of hypoglycemia to convulsions may be reasonably assumed, at least in some instances.

BONAR, Salt Lake City.

MENTAL HYGIENE IN CHILDHOOD. IRA S. WILE, J. A. M. A. **93**:1874 (Dec. 14) 1929.

In private practice, child guidance clinics and school clinics, there is the ever present necessity for a careful analysis of the biologic and social factors entering into every juvenile situation. A warning is necessary at this time because the demand for such clinics for children as well as adults is multiplying so rapidly that there is a dearth of adequately trained physicians, psychiatrists and pediatricians to meet their needs. Unwise guidance means unsound teaching, which in turn is a poor form of mental hygiene. At present a mental hygiene program is needed which demands that no mental clinic be opened except under the direction of persons properly trained in theory and practice. There is need for the promotion of personal health and rational mental guidance during childhood. Mental hygiene is to be regarded as a form of social prophylaxis to prevent the development of mental defects in epileptic, psychoneurotic, psychotic and maladjusted persons. It also serves to diminish the number of maladapted children and adolescents whether their maladjustment finds expression in egocentricity or eccentricity, in benign stupor or manic activity, in enuresis or excessive seclusiveness, in juvenile delinquency or adolescent crime.

BONAR, Salt Lake City.

CHOREA. JESSE R. GERSTLEY, M. Clin. North. America **13**:427 (Sept.) 1929.

On close observation the characteristic muscular phenomena of chorea will be seen to be of two types or combinations: (1) lightning-like contractions of isolated muscle groups, groups which cannot be made to contract voluntarily, and (2) incoordinate, awkward movements of the larger muscle groups. In doubtful cases, the following reactions may be helpful: On testing the knee-jerk, it will be noted that one tap produces a decided response; on repeated tapping, the leg is thrown into a sort of tetanus, and held in extension for several seconds. When voluntary movements of an extremity, such as gripping a hand, are brought about, associated movements in the corresponding extremity of the side most affected are more marked than on the side less involved. In mild cases, in which the patient shows no symptoms when at rest, characteristic movements may be produced if the child is put to some mental strain, such as being given a difficult problem in arithmetic.

Every study of the etiology of chorea so far has been inconclusive. There is much evidence in favor of the infectious origin of chorea, but the absolute failure of tonsillectomy and the disappointing results from the treatment of other foci have led to the suspicion that it may not be as closely related to rheumatism as has been thought. Cardiac complications have not been severe except in the rare combinations when chorea and rheumatism have exisited simultaneously. It may be a clinical entity in itself, independent of the tonsillitis-endocarditis group. Possibly it forms a soil favorable for rheumatic infection, or there may be a symbiotic relationship between the two conditions.

Treatment consists of mental and physical rest in bed, prolonged until the symptoms have disappeared and until they remain absent even when the child is subjected to some mental strain. In certain cases not easily differentiated from the others, arsenic may prove of considerable value.

SMITH, Ogden, Utah..

CONVULSIONS IN INFANCY AND CHILDHOOD. I. BINDER, M. J. & Rec. **130**:86 (July 17) 1929.

Convulsions are of frequent occurrence in early childhood, and may be divided as to their type, clonic or tonic, as to their form, general or local, and as to the seat of irritation which causes them, central or reflex. Many theories have been advanced to explain the occurrence of convulsions. The author quotes the theories of Soltman, Kussman, and Tenner and Northnagel.

The causes of convulsions are multiple. Age is the important predisposing factor. The great majority of cases occur in the first year of life. The recognition of a typical attack of convulsions is easy. A differential diagnosis should be sought for from (1) a carefully taken history, (2) the age of the child and (3) a history of fever. Convulsions with fever may mean: (1) infectious diseases, (2) acute disease of the nervous system, or (3) convulsions, gastro-enteric in origin, beginning locally and remaining so for several hours; marked orbicularis contractions denote organic mischief. In conclusion the author states that one's duty is to control the convulsion, to prevent its recurrence, to stay with the patient until the convulsion has apparently subsided and to find out the exciting cause.

WILLIAMSON, New Orleans.

OBSCURE ABDOMINAL SYMPTOMS PRECEDING EPILEPSY IN CHILDHOOD. THOMAS MYERS, Minnesota Med. **12**:428 (July) 1929.

Myers reports three cases of obscure abdominal symptoms preceding epilepsy in childhood. He comes to the following conclusions:

Epilepsy in childhood may frequently manifest itself for the first few years in atypical disturbances which may not suggest the underlying disease.

Visceral attacks of varying nature may be the only symptom, often pointing toward abdominal trouble only, and may be easily misinterpreted.

The frequent repetition of a set of obscure correlated symptoms, with lack of organic pathology, should always suggest epilepsy.

Of particular importance in obtaining the history of such cases is the ascertaining of fleeting disturbances of consciousness. These may be frequently overlooked by the parent whose mind is fixed on the theory that the child is suffering only from attacks of abdominal pain.

HUENEKENS, Minneapolis.

POST-ENCEPHALITIC DELINQUENCY. RENÉ CRUCHET, Edinburgh M. J. **36**:573 (Oct.) 1929.

Professor Cruchet of the University of Bordeaux gave this lecture at the University of Edinburgh, April 23, 1929. He begins by recalling that during the World War the mental manifestations of the affected persons were what put him "on the road to discovery of epidemic encephalitis." He, along with Moutier and Calmette, then called it subacute encephalomyelitis. When he saw cases of a peculiar type of this disease at Verdun and Commercy during the period of the war from 1915 to 1916, it recalled his acquaintance with the common encephalitis of childhood gained through fifteen years of children's service at the Bordeaux Clinic, as well as in the neurologic clinic of Professor Pitres. He had described many different forms, such as choreic, meningitic, hemiplegic, pontocerebellar, bulboprotuberential, ataxic, anterior poliomyelitic and polyneuritic. The disease, as more was known about it, was found to assume many aspects, the diversity of which is a characteristic attribute. Therefore in the present article Cruchet emphasizes the importance of the polymorphism of encephalitis, which is found in any of the clinical forms as well as in the mental forms.

The various clinical mental syndromes of this disease are hard to recognize, but the most usual type is a mental state with appearance of confusion or of dementia praecox. The author narrates the history of a boy, aged 10, as illustrating this type of mental case better than any description of symptoms could give. He has followed the patient to the age of 19 years, and describes in detail the many reprehensible habits. Postencephalitic cases, whether in children or in older persons who have psychotic diseases of this type, resemble one another. However, the author believes that these cases, while showing perversions, have originated from illness and the patients are therefore not to be classed as true perverts. Formerly such a child has been normal, but he becomes restless, lazy, impulsive, incoherent, amenable to suggestions or obstinate, capable of indecent offenses, thievish and greedy. He may grow better or worse, but usually his state does not change as he passes through the various periods of life. The mental state has become constitutional. Such persons are weak in school work and in memory. They grow impatient at sustained efforts and easily make mistakes. Such children must be placed in a school for abnormal children, such as the one near Bordeaux of which Cruchet is the head. They are weak-minded, mentally debilitated and unstable. The marked effect of the encephalitic virus is to regroup the mental clinical states, producing a disorientation and a disorder of the mind.

NEFF, Kansas City, Mo.

THE PROBLEM OF JUVENILE BEHAVIOUR DISORDERS IN CHRONIC EPIDEMIC ENCEPHALITIS. T. R. HILL, J. Neurol. & Psychopath. **9**:1 (July) 1928.

The clinical features of juvenile behavior disorders in chronic epidemic encephalitis are described with illustrative cases. Intelligence was preserved, and insight was clear. The conduct was compulsive and of a crude, primitive and instinctive type. It is suggested that there is an overpowering increase in the pleasure that normally comes from obeying instinctive tendencies and in the displeasure that normally comes from obstructing them. The pathologic change is of an organic nature, causing exaltation of thalamic function either by thalamic release through loss of cortical inhibition or by chronic irritation and excitation. The encephalitic virus is known to center on the thalamostriatal level, and the cortex is obviously not seriously involved. The bradyphrenia of the parkinsonsian syndrome is characterized by good intelligence with a subjective state of mental inertia and loss of

interest or feelings. It is contrasted with the mental state in cases with behavior disorder and may well be due to a depression of thalamic function. Hence, one may assume that the initial irritative lesion develops finally into a destructive one.

FAVILL, Chicago.

FAMILIAL PLANTAR PERFORATING ULCER WITH PROBABLE LUMBOSACRAL SYRINGOMYELIA IN TWO BROTHERS. G. GUILLAIN and A. THEVENARD, Ann. de méd. **25**:267 (March) 1929.

Syringomyelia has been reported in different members of the same family, but only Bruns, Schlutze and Bremer found a combination of this disease with symmetrical gangrene of the feet. To these cases the authors add the case reports of two brothers. One developed the ulcerations at the age of 13, the other at 16. In the second case scar formation after prolonged rest in bed interrupted the disease process in two intervals of three years and one year, respectively. Neurologic examination during the third period revealed exaggerated patellar reflexes, absence of plantar reflexes and normal cremasteric and abdominal reflexes. There was a bilateral zone of thermophypalgesia beginning at the middle of the calves of the legs which gradually continued into a zone of complete thermo-analgesia around the heels. Sensibility to pain was diminished in the soles of the feet and completely abolished within the ulcerations. Tactile sensibility was not disturbed. There were no sphincter or genital disturbances. There was excessive perspiration on the lower halves of the calves of the legs and on the feet. Roentgen and spinal fluid examinations gave negative results.

WEIL, Chicago.

ACCIDENTS ON THE NINTH DAY IN THE COURSE OF CEREBROSPINAL MENINGITIS, RELAPSE AND SERUM REACTION. JEAN HUTINEL and RENÉ MARTIN, Bull. Soc. de pédiat. de Paris **27**:163 (March) 1929.

A girl, aged 25 months, had rhinopharyngitis. She developed typical meningitis nine days later. She was treated by injections of antimeningococcic serum, intrathecally and intramuscularly, and she was much improved. She had lost all of the stiffness which she showed previously, and the spinal fluid was almost clear and almost free from meningococci. Nine days after the onset of the meningitis and after this marked improvement had taken place, she suddenly developed hyperpyrexia, vomiting and urticaria. Lumbar puncture yielded a markedly turbid fluid again and the number of meningococci present in the fluid was markedly increased, but the child did not show the same meningeal signs at this time that she did at the onset of the meningitis. Antimeningococcic serotherapy was again instituted. The child was comfortable and the temperature dropped to normal in five days. The spinal fluid cleared rapidly and fifteen days after the relapse of fever it showed fifteen cells, almost all lymphocytes, and was sterile. The authors feel that antimeningococcic serum does good in the case of meningococcus B infection, the type which was rare until after the Great War. They treated this case as if a relapse had occurred, but they feel that it may not have been a true relapse. The serum reaction may have caused the return of meningococci into the spinal fluid. The prognosis when a serum reaction takes place at the same time as the spinal fluid shows an increase of meningococci, seems good, as in this case it took only a small amount of serum to eliminate the organisms from the spinal fluid.

BENJAMIN, Montreal.

TETANY FROM HYPER-RESPIRATION. VIRGINIO PORTA, Boll. Soc. ital. di biol. sper. **3**:1282 (Nov.) 1928.

All the symptoms of tetany may be induced by profound respiration, the exhalations to be especially complete, voluntarily by man or by means of a pulmotor on animals. A series of tests was made on human beings as well as on cats and rabbits. The carbon dioxide content was lowered 60 per cent and the reserve

alkalinity 14 per cent. The p_H increased slightly, and the calcium slowly but steadily by reason of an increase in calcium proteins; the Ca^{++} decreased (this was the cause of the motor disturbances). The dextrose increased somewhat and was probably associated with hyperadrenalinemia. Air, with from 2.5 to 5 per cent carbon dioxide, did not produce tetany, while pure oxygen, unless stopped within three or four minutes, produced delirium. Alkalosis is a less important factor than the vasomotor disturbances because of the hyperventilation of the lungs.

KUGELMASS, New York.

PATHOLOGY OF PROGRESSIVE MUSCULAR DYSTROPHY (SPINAL CORD CHANGES). J. M. NIELSEN, Arb. a. d. neurol. Inst. a. d. Wien. Univ. **31**:158, 1929.

The case reported was diagnosed clinically as pseudohypertrophic muscular dystrophy and hydrocephalus. Although the patient was only 28 when he died, necropsy showed remarkable evidences of senescence in all systems. There were vascular sclerosis and lipodystrophy of the ganglion cells in the cord, varying in intensity from atrophy with swelling to complete destruction. The lesions, as was to be expected, were more severe in the anterior horn cells in the lumbar segments. There was very little glial reaction anywhere. Stilling's cervical nuclei and the posterior horns were fairly well preserved. The myelin sheaths showed marked destruction in the ventral horns and efferent roots. There was no acute degeneration of the nerve fibers. The author raises the questions whether the dystrophy is a sequela to the spinal process, whether the spinal process is secondary and due to the muscular disease or whether both the spinal and the muscular processes are due to a common cause (noxa). He makes no attempt to answer any of them.

KESCHNER, New York.

MYOTONIA CONGENITA IN A BROTHER AND SISTER. M. BODDIN, Arch. f. Kinderh. **88**:1 (July 12) 1929.

A girl, aged 1 year, showed typical symptoms of myotonia. She died shortly afterward from a respiratory infection. Autopsy showed the muscles to be infiltrated with adipose tissue, of which there was considerable in the muscle bundles. Three years later the child's brother, aged 10 months, showed similar symptoms. The definite diagnosis in the latter case lies between myotonia and early infantile spinal muscle atrophy. The observations at autopsy in the first case and the similarity between the symptoms in the two cases, with the physical observations, make myotonia congenita the preferred diagnosis.

SANFORD, Chicago.

THE PATHOGENESIS OF LIPODYSTROPHY. E. K. EWSEROWA, Ztschr. f. d. ges. Neurol. u. Psychiat. **118**:489 (Feb. 11) 1929.

In 1911, Simmonds described under the name of lipodystrophy a disease characterized by atrophy of the subcutaneous fatty tissue in the face, arms and upper part of the trunk, with simultaneous involvement of the fat in the gluteal region and the lateral parts of the hips. His case occurred in a girl, aged 11, and ran a very slow course. In 1926, Gangliomo collected sixty such cases from the literature, all in women and all with slow courses. The disease may occur in men and may begin late, as Long and Bickel have shown. There is an atypical form in which the fat atrophy involves either only the upper part of the trunk, the face and the hands, or is accompanied by a hypertrophy of the fat in the gluteal region. Barraquer, in 1906, described the first variant, five years before Simmonds, and in 1912 Laignel-Lavastine described a case with fat hypertrophy of the lower extremities without atrophy. Simmonds regarded these merely as variants of the lipodystrophy which he described. Progressive lipodystrophy may be accompanied by symptoms of vegetative and endocrine insufficiency — trophic disturbances of

the skin and nails, pigmentation of the skin, hypertrichosis, dryness of the hair, tendency to sweating attacks, acrocyanosis, polyuria, oliguria and glycosemia.

The pathogenesis of the disease is not clear. Simmonds first classed it with the trophoneuroses and in a later communication denied the possibility of a pure sympathetic origin on the basis of a lack of other sympathetic signs; he compared the disease to progressive muscular atrophy. Other authors believe that the disease is either an endocrinogenic disease, or one of neurogenic or mixed origin. A small group look on the disease as of tuberculous or toxic origin. Aplasia of the thyroid has been found in a few cases, but feeding thyroid has always resulted in an increase in the fat atrophy. Hypertrophy and hyperplasia of the ovaries have been found. In a few cases atrophy of the suprarenals has been found, and also hypertrophy and hyperplasia of the hypophysis. In a case of lipodystrophy, Marburg investigated carefully all the endocrine glands and the tuber cinereum and found regressive changes in the ovaries and hyperplasia of the hypophysis.

Lipodystrophies are observed in lesions of the peripheral nervous system, spinal cord and brain. Peripheral type: Fatty atrophy has been observed in guinea-pigs after section of the sciatic nerve, and Landouzy has seen it in man in sciatica. Others have found it in alcoholic polyneuritis. Giese found a laminated sort of fatty atrophy in a case of hereditary syphilis following the course of the lumbar roots. Spinal type: Müller removed the lower part of the cord in dogs in order to study the localization of the bladder and rectum functions, and observed, as an accidental thing, a fatty hypertrophy of the lower extremities. He also reported a fatty disease of the legs after a contusion of the spine, and in a second case after a fracture of a lumbar vertebra. Simmonds observed a unilateral fatty hypertrophy of the tongue as a result of an abiotrophy of the hypoglossus which was confirmed histologically. He also found a disappearance of fat in one mamma after an infantile poliomyelitis. Cerebral type: Unilateral fatty hypertrophy and atrophy in hemiplegia are well known. Allied to these is hemiatrophia facialis in which the sympathetic plays an important rôle, and which differs from lipodystrophy through participation of the skin and joints in the process.

Ewserowa reports a case of lipodystrophy in a woman, aged 33, who at 30 began to have attacks of migraine in the left side of the head. A few months later, the left side of the face was definitely atrophied, the menses became irregular, severe and painful, and the atrophy spread to the upper part of her arms and trunk. For a year she had had jacksonian epilepsy in the left hand; it had now spread to the face and was accompanied by loss of consciousness. Physically, she showed hyperreflexia, lost corneal reflex, dysesthesia of the left trigeminal distribution, and lipodystrophy of the Barroquer type — fatty atrophy of the face, upper extremities and upper part of the trunk. Roentgen examination showed a bony tumor of the sella turcica, but without visual field changes.

The case of Ewserowa differs from the classic cases of lipodystrophy in the late onset, the rapid development in the course of three years and its accompaniment by other cerebral symptoms. Ewserowa subscribes to the cerebral genesis of lipodystrophy on the basis of the case reported.

ALPERS, Philadelphia.

Diseases of the Eye

PATHOLOGIC EFFECTS OF ULTRAVIOLET RAYS ON EYE AND TREATMENT. E. G. LEAR, New York State J. Med. **29**:1270 (Oct. 15) 1929.

Lear asserts that the ultraviolet rays are capable of producing a definite pathologic condition of the eye called "photo-ophthalmia." There is a definite period of latency between the time of exposure and the onset of the symptoms. A certain definite amount of these rays is capable of producing the pathologic condition in one or a liminal dose or in fractional or subliminal doses, the sum total of which should equal one continuous or liminal dose. The onset of the symptoms are first itching, then pain and photophobia. It is proved definitely, clinically as well as experimentally, that the parts of the eye involved are the conjunctiva, cornea, iris

and lens. Whether the retina, too, is affected by these rays is not definitely established and remains to be determined by future observation and experiment. As regards the treatment, the ordinary treatment of conjunctivitis, such as the administration of silver nitrate or zinc sulphate, will aggravate the condition. The most gratifying effects are obtained from the immediate instillation of a suitable cycloplegic, preferably homatropine, with cold applications, and the wearing of smoked glasses against strong rays of light.

ZENTMAYER, Philadelphia.

AN INQUIRY INTO THE ORIGIN OF THE ABNORMAL PIGMENTATION OF THE SKIN AND CONJUNCTIVA IN CASES OF KERATOMALACIA IN ADULTS. A. PILLAT and G. KING, Brit. J. Ophth. **13**:506 (Oct.) 1929.

One of the most striking symptoms of xerosis epithelialis conjunctivae and of keratomalacia of adults in China is the pigmentation of the conjunctiva. In certain cases there is also a dark staining of the skin. The pigmentation was present in from 70 to 80 per cent of all the cases of keratomalacia seen in Peiping in the spring of 1929, but in varying intensity.

In keratomalacia the pigmented area has a peculiar dark brown color which resembles "argyrosis" or that seen in bronze diabetes or in Addison's disease. The pigment itself seems to have the same hue in all cases. Even the slightest pigmentation of the conjunctiva is as dark in its individual points as in an advanced case; the greater number of pigment dots produces the darker color. The pigment lies chiefly in the basal cell layer of the epithelium and in the intercellular spaces, from which it advances into the middle layers and in some cases extends almost to the surface of the keratohyaline edges of the thickened epithelium. The pigment increases in intensity as long as the keratomalacia progresses and disappears in the process of healing but at a much slower rate than do the other clinical symptoms.

In order to determine the rôle the liver plays in the production of the conjunctival pigmentation the authors undertook special tests of liver function in a series of twelve cases of keratomalacia. Their investigation seems to show that it is improbable that any marked degree of impairment of the function of the liver is present in cases of keratomalacia, and that the pigmentation found in such cases is probably not of biliary origin.

ZENTMAYER, Philadelphia.

MULTIPLE CYSTS OF THE IRIS. GALLEMERTS and GAUTHIER, Ann. d'ocul. **166**: 436 (June) 1929.

The patient was first seen at the age of 4 when a small cyst of the upper half of the iris of the right eye was incised. Fourteen years later he returned with five cysts of the superior portion of the right iris. One cyst was considerably larger than the other four. All were filled with transparent fluid, except one which contained granular masses. The largest cyst was covered with pigment dots and had fibrous striae along its anterior wall.

Examination with the slit-lamp revealed a clear space between the posterior surface of the cornea and the anterior wall of the largest cyst.

At operation, under a retrobulbar injection of procaine hydrochloride and epinephrine plus instillation of cocaine, a conjunctival flap surrounding the upper half of the cornea was dissected free. Then sutures were placed in the flap. Next a keratome incision was made in the upper border of the cornea and enlarged to the horizontal meridian with scissors, so that the superior half of the cornea could be reflected back in such a manner as to expose entirely the portion of the iris containing the cysts. All of the latter, including their walls, were excised, thus preventing a recurrence. After the cornea was replaced in its normal position, the wound was covered with the conjunctival flap.

An attack of iritis followed the operation, but it was quickly controlled by atropine. There was a synechia below and a few pigment dots were seen on the lens.

SCARLETT, Philadelphia.

A Case of Congenital Ptosis: Operation by a New Method. M. Nida, Ann. d'ocul. **166**:639 (Aug.) 1929.

The operations of de Wecker, Angelucci, Hess, Panas and Poulard were mentioned, also the methods of Motais and Parinaud.

The principle of the operation of Nida consists in the attachment of the tendon of the superior rectus muscle to the superior border of the tarsus, without severing the connection of the former from the globe.

Local anesthesia of procaine hydrochloride 4 per cent plus a few drops of epinephrine was employed in the case reported. The lid was everted during the whole operation. The tendon of the superior rectus muscle was carefully dissected free, especially on the sides and the scleral surface, without detaching it. A transverse narrow flap was next dissected from the upper border of the tarsus, the temporal end remaining attached, while the nasal end was cut free. The tarsal flap was slid under the tendon, after a double armed suture was placed in the free end. It was sutured in its original position, after sliding it under the elevated superior rectus tendon.

The immediate and ultimate results were good. There were no corneal complications, diplopia or lagophthalmos.

Scarlett, Philadelphia.

Congenital Unilateral Graefe's Sign in Facial Myopathy; Mechanism of Graefe's Sign. J. Strebel, Schweiz. med. Wchnschr. **59**:906 (Sept. 7) 1929.

Strebel describes the case of a man with congenital unilateral facial myopathy in whom Graefe's sign was noted. The pathologic conditions in this case and in a case of exophthalmic goiter illustrate the mechanism of Graefe's sign. If the orbicularis is paretic, or if the action of this muscle is hindered by an exophthalmos, the levator palbebrae superioris will exert a stronger influence than the orbicularis and so produce the condition that is known as Graefe's sign. In short, this symptom is the result of an insufficiency of the orbicularis.

Zentmayer, Philadelphia.

The Prophylactic Treatment of Ophthalmitis of the New-Born. Günther Schäfer, München. med. Wchnschr. **76**:1635 (Sept. 27) 1929.

Schäfer enumerates the several possible disadvantages to the use of 1 or 2 per cent silver nitrate solution in an ordinary bottle for prophylactic treatment in ophthalmitis of the new-born: A higher per cent of silver salt may be dispensed, owing to faulty preparation; more than one drop may be put into each eye; evaporation may result in the concentration of the solution; chemical decomposition of the silver nitrate may cause liberation of nitric acid. The author found the use of silver acetate and organic silver preparations unsatisfactory. For use in the home, a hermetically sealed ampule of 1 per cent silver nitrate, closed at each end with paraffin, has met most of the serious objections to the preparations previously used. However, the author thinks that in a hospital in which large quantities of carefully prepared silver nitrate are used, the older technic of dispensing in bottles is satisfactory.

Brahdy, Mt. Vernon, N. Y.

Familial angiomatosis retinae et cerebelli (Lindau's Disease). H. U. Möller, Acta ophth. **7**:244, 1929.

From a survey of the literature, Möller finds that there is an association of angiomatosis retinae, von Hippel's disease, with a similar disease of the central nervous system. Several authors, particularly Lindau, believe that both conditions are due to a congenital anlage. It is difficult to determine which disturbance manifests itself first. The disease may be present only in the cerebellar tissue; yet there is a possibility that a retinal angioma is also present simultaneously

in all cases, but of microscopic size. Most of the cases reported disclose a familial tendency. The author suggests that the diagnosis of "Lindau's disease" should be made only when the following factors can be demonstrated: cerebral tumor plus familial incidence, or retinal angiomatosis plus cerebral tumor with or without familial tendency.

YUDKIN, New Haven, Conn.

PROTEIN TREATMENT FOR HEREDITARY INTERSTITIAL KERATITIS. B. SLAVIK, Časop. lék. česk. **66**:336 (Feb. 25) 1927.

Intragluteal injections of milk and both intramuscular and intravenous injections of typhoid vaccine were used in a number of adults with interstitial keratitis. Routine antisyphilitic treatment was given simultaneously. The author does not recommend the treatment in very young children because of the possibility of a severe reaction. Typhoid vaccine is preferred because it produces a greater reaction and fever, which is taken as an index of the greater mobilization of the protective forces of the body. If this treatment is initiated early the possibility of saving the essential portions of the sclera is greater.

STULIK, Chicago.

Diseases of the Ear, Nose and Throat

DIATHERMOCOAGULATION OF THE TONSILS. M. BOUTAREL, Paris méd. **2**:476 (Nov. 30) 1929.

The author expresses his belief that diathermic coagulation of the tonsils is indicated in cases of hemophilia, hemorrhage of any form, cardiac involvement, abscess and tuberculosis.

SANFORD, Chicago.

RETROPHARYNGEAL ABSCESS AS A COMPLICATION OF MASTOIDITIS. J. MISSIONŽNIK, Monatschr. f. Ohrenh. **63**:481 (May) 1929.

Missionžnik recognizes five paths of entry for the spreading of pus from the apex of the mastoid process into the pharynx. He supports the theory of Mygind who sees in the incidence of a retropharyngeal abscess as complication of a peribulbar abscess, persistence of the symptoms characteristic of a carotid abscess. Thus, high temperature, painful swelling of the carotid nerve and early differentiation of tissue occur. Abscess of the digastricostylopharyngeal muscle shows fewer external symptoms, but reactions of the posterior pharyngeal wall are evident. The most frequent type of abscess is the one found in the sternocleidomastoid muscle; it is characterized by high temperature, symptoms of torticollis, and circumscribed swelling of the retromandibulbar region and the carotid nerve. Reactions from the abducens and trigeminal nerve are evident in discharge of pus from the apex of the petrosal sinus. Lastly, a retropharyngeal abscess can be caused by suppuration of the retropharyngeal lymph nodes which are partly collectors of the lymph from the middle ear.

[ARCH. OTOLARYNG.]

ETIOLOGY OF ADENOIDS: STATISTICAL INVESTIGATION. E. SAARESTE, Monatschr. f. Ohrenh. **63**:824 (Aug.-Sept.) 1929.

In 1,366 school children from Tartu (Dorpat), Esthland, Saareste examined the relative extent of the tonsils by means of pharyngoscopic and postrhinoscopic methods. Adenoids were evident in 659 children (48.2 per cent); 459 had minor growths (33.6 per cent); in 148 children (10.8 per cent), the vegetations were of medium size; in 52 (3.8 per cent), large adenoids were seen. Hypertrophic tonsils were seen in 430 children (31.5 per cent). Three hundred and twelve children (22.8 per cent) had adenoids and hypertrophic tonsils. Spontaneous involution of the adenoids occurred in general at the beginning of puberty (about 13 years of age), but was observed to a slight degree at 10 years. Children from poorer classes had larger adenoids than those in higher schools. Fifty-two and three-tenths

per cent, or 429 children having adenoids lived in the city, whereas 42 per cent, or 230, were country bred. Of especial interest was the fact that large adenoids were found in 5.4 per cent of the city children, but in only 1.6 per cent of the country children. There was no evidence that scarlet fever or measles had had any influence.

[ARCH. OTOLARYNG.]

FOREIGN BODIES IN THE ESOPHAGUS AND RESPIRATORY TRACT. B. HALMÁGYI, Monatschr. f. Ohrenh. **63**:847 (Aug.-Sept.) 1929.

Halmágyi reports that during the period between 1922 and 1928 he extracted 112 foreign bodies with the help of the esophagoscope or tracheobronchoscope. The foreign body was located in the esophagus fifty-eight times; six times in the pyriform sinus, eight times in the larynx, nineteen times in the trachea and twenty-one times in the bronchi. Patients who had a foreign body in the esophagus reported at the clinic sooner than those with one in the respiratory tract; only four of these reported within twenty-four hours of the accident, the others, days and even months later. On the whole, foreign bodies are well localized, depending on the intelligence of the patient. Some have maintained that they suffered from dyspnea, when neither the site nor the size of the relatively small foreign body could have caused a respiratory disorder; on the other hand, bronchial cases were noted in which the patients had difficulty only in swallowing. Halmágyi points out that the main cause of complications may be ascribed to the fact that a specialist is consulted only after weeks or months. To avoid these complications, immediate advice or treatment is necessary.

[ARCH. OTOLARYNG.]

ACUTE MASTOIDITIS IN RELATION TO EPIDEMICS. E. URBANTSCHITSCH, Monatschr. f. Ohrenh. **63**:882 (Aug.-Sept.) 1929.

Urbantschitsch made a statistical study of the operations done at his clinic within the last fifteen years. Six hundred and thirty-seven mastoidotomies were done on 533 patients; on 104 patients, the operation was done on both sides. The discrepancies found between his own results on the incidence of mastoiditis in infectious diseases and Barwich's previous reports may be explained by the difference in their material, Urbantschitsch's clinic being at the main hospital in Vienna, to which all patients with infectious diseases are referred.

[ARCH. OTOLARYNG.]

PRELIMINARY COMMUNICATION ON THE TOE PHENOMENON OBTAINED BY PRESSURE ON THE OCCIPUT IN DISEASES OF THE MIDDLE EAR IN CHILDREN. B. GRÜNFELDER, Ztschr. f. Kinderh. **47**:641 (May) 1929.

The great toe in this phenomenon is held similarly to that in the Babinski phenomenon, dorsiflexed, while the other toes are spread like a fan. In children with beginning and existing otitis media, the sign could be elicited by pressure on a definite place in the occiput, which corresponds to a depression where the lambdoid suture, the sutura mastoidea occipitalis and the sutura mastoidea parietalis intersect. In the larger children this point lies on the intersection of the line which is drawn from the depression on the mastoid process toward the vertex with the line which runs horizontally over the upper border of the auricle. Anatomically, the point of pressure lies on the edge of the superior auricular muscle and impinges most probably on a branch of the posterior auricular nerve. On the inside of the skull the point corresponds to the most outward point of the transverse sulcus. A needle stuck in the designated corner in a cadaver meets the tentorium and the upper tip of the cerebellum. In the infant the point lies somewhat deeper in the occiput and corresponds to a corner of the posterior lateral fontanel. In a child with otitis media the toe phenomenon is to be obtained on the side opposite that ear; that is, it occurs on the same side as the sound ear, and in many cases only with long continued pressure.

EMERSON, Boston.

CONTRIBUTION TO THE PHYSIOLOGY OF THE TONSIL. T. MURATA, Ztschr. f. Laryng., Rhin. **18**:70 (March) 1929.

Murata discusses the relation between the tonsils and the adjacent lymph glands and ducts. On the basis of his experiments on twenty-seven patients made by injection of india ink before tonsillectomy for studying the defense mechanism against penetration of corpuscular elements into the tonsils and a review of the literature, he draws the following conclusions: India ink spread evenly over the surface of the tonsils does not penetrate into the stroma. Neither does it do so if injected into the capsule or the surrounding tissue. It may be found in the excretory lymph ducts. India ink injected into the subepithelial layer of the tonsils usually remains around the site of injection. Small amounts, however, penetrate into the center within the lymphoid tissue and the follicular connective tissue, and in rare instances it can be seen in the epithelium. Murata states that injected into the tonsillar tissue, india ink is spread diffusely and with almost equal distribution in the lymphoid tissue, connective tissue within the tonsil. However, it then drains toward the periphery in a netlike manner and is increasingly absorbed by the cells. There may be a resistance against penetration of foreign bodies between follicle and diffuse lymphoid tissue and between lymphoid tissue and interfollicular connective tissue or epithelium. The india ink present in the epithelium forms circumvallate heaps of small or large granules.

[ARCH. OTOLARYNG.]

INDICATIONS FOR AND TECHNIC OF TONSILLECTOMY. J. PORAS, Ztschr. f. Laryng., Rhin. **18**:82 (March) 1929.

According to Poras, whose personal experience within the last few years covers more than 1,800 tonsillectomies, none of which had an unfavorable outcome, the tonsils are not of vital importance, and they can be removed at any time without danger to the patient. He states that the tendency toward sore throats is a sufficient indication for their complete surgical removal. The preferred type of operation in children is according to Sluder's method; in adults, tonsillectomy is advised with a blunt raspatory. For the purpose of checking venous bleeding, the use of a hemostatic drug is advised, given locally by insufflation, subcutaneously or by intravenous injection. Arterial hemorrhage is stopped by a ligature around the vessel. For alleviating the pain caused by the wound, tampons soaked with antivirus are allowed to remain for a short while in the wound cavity; they have proved most efficacious. If the operation is done on account of sepsis or a suggestion of sepsis, a favorable result can be expected only if not more than one or two chills have occurred and if ligation of the jugular vein is done coincident with the tonsillectomy. Care should be taken that the ligature is made as far down as possible below the phlebitic portion of the vessel; in this case, only operation may save the patient's life. Otherwise the prognosis is almost invariably serious.

[ARCH. OTOLARYNG.]

COMPLICATIONS FOLLOWING TONSILLECTOMY. H. CLAUS, Folia Oto-Laryngol. **19**:89 (Nov.) 1929.

From the consideration of thirteen cases reported within the last two years, in nine of which death occurred, Claus points to the danger of infection. In many cases it may be due to penetration of the infected tonsil and the still healthy muscular tissue with the same needle on injection for local anesthesia, thus creating a new focus of infection. Claus also considers operation in an acute stage of tonsillitis dangerous and advises that a period of four weeks be allowed to pass before tonsillectomy. In case symptoms of general infection are noted, immediate tonsillar mediastinotomy should be done, together with injection of vaccine. Ligation of the veins should go hand in hand with drainage of the connective tissue. Two patients in whom these interventions were done were saved.

[ARCH. OTOLARYNG.]

INDICATIONS FOR ADENOTOMY (ADENOIDECTOMY). J. CISLER, Časop. lék. česk. **66**:485 (March 28) 1927.

In congenital anomalies of the palate and nasopharynx the question of sufficient tissue to prevent rhinolalia and other speech defects must be considered before adenoidectomy is done. In atrophic rhinitis with or without ozena, adenoidectomy may aggravate the condition. Operation should not be attempted during acute infection of the nasopharyngeal-otitic apparatus. Care should be exercised in operating in an environment of contagious disease. Such disturbances as hemophilia and leukemia are contraindications.

STULIK, Chicago.

CATARRHAL INFECTION OF THE MIDDLE EAR IN THE 1927 EPIDEMIC OF GRIP. B. HORNIČEK, Časop. lék. česk. **66**:650 (April 15) 1927.

During January, 1926, of 869 ambulant otolaryngeal patients, 155 developed infection of the middle ear; 19 of these cases were acute and required a paracentesis. On the other hand, during January, 1927, 253 of 1,160 patients developed middle ear complication; 42 of these cases were acute and required paracentesis. Of the latter cases, three were complicated by pachymeningitis and periphlebitis.

STULIK, Chicago.

Miscellaneous

STATUS AND TECHNIC OF NATURAL AND ARTIFICIAL HELIOTHERAPY. PERCIVAL NICHOLSON, Arch. Pediat. **46**:401 (July) 1929.

Natural sun baths may be continued well into the winter. During the winter, however, the beneficial effects are mainly due to the air bath. In the summer gradually increasing daily doses are given. Since the ultraviolet rays of the sun reaching the temperate zone in the winter are so diminished, the use of the quartz windows is of little practical value.

The author has employed the mercury vapor quartz lamp, using the technic of Mayer and irradiating the entire body in four quadrants with gradually increasing time and diminishing distance. He now uses and prefers the method of Edinow and Hill, placing the burner from 36 to 30 inches (91.4 to 76.2 cm.) from the skin surface with an exposure of the front of the chest for two minutes. Two days later, the back is exposed for a period sufficiently long to cause a mild erythema. Later the front of the legs, the back of the legs and the front of the chest, in the order named, are exposed, with a gradual increase in the dosage to produce a mild erythema at each exposure. Overexposure may cause failure to gain weight or even loss of weight. Indications and illustrative cases are given.

WILSON, Norfolk, Va.

MODERN STUDY OF CONSTITUTION IN CHILDHOOD. A. HYMANSON, Arch. Pediat. **46**:495 (Aug.) 1929.

Two basic types are recognized: those with large and those with small viscera, the megalosplanchnic and the microsplanchnic. This distinction is not peculiar to any age but exists in the child. A lowered rate of metabolism is found in the megalosplanchnic type; hence, in this class is the arthritic, lymphatic, strumous, exudative and vagotonic type of child. However, it is not only this type of person who can have such disease; he is only more predisposed to it.

Theoretically the opposite type, the microsplanchnic, should exist, but little reference is made to this type except in older persons. The microsplanchnic person is of the asthenic, atonic, sympatheticotonic type, and evidently during the adolescent and adult periods is prone to tuberculosis. Hybrid types are mentioned; also those with a normal metabolic rate and normally sized viscera (normosplanchnics). Many deviations from normal are of congenital origin and may run in families. Local deviation from the normal may occur. Psychic differences are hardly visible in the child, the normal child being naturally

extroverted; introspection is largely the consequence of illness, invalidism and external restrictions. The practitioner should seek for the constitutional causes of various ailments, for example, infantile atrophy or marasmus. The author cites Naegeli's emphasis of the treacherous character of the knowledge of disposition to disease; also his reference to the double mutation which may affect the causal micro-organisms on the one hand and the human constitution on the other. In this way, new diseases and new disease types may appear.

WILSON, Norfolk, Va.

ANILINE AND NITROBENZENE POISONING IN INFANTS. MENDEL ZELIGS, Arch. Pediat. **46**:502 (Aug.) 1929.

Four cases of poisoning are reported, in which all the patients recovered. Three were due to absorption through the skin of dye from freshly stamped pads; one to inhalation of a poison for bed-bugs.

Boiling freshly dyed articles renders them harmless. A warning is given against the indiscriminate use of aniline and its derivatives as a dye for infants' clothing.

WILSON, Norfolk, Va.

ACUTE PHOSPHORUS POISONING FROM THE INGESTION OF ROACH PASTE: FATAL CASE IN CHILD. STAFFORD MCLEAN, AILDRED MACDONALD and RUTH C. SULLIVAN, J. A. M. A. **93**:1789 (Dec. 7) 1929.

The authors emphasize the danger of the careless use of roach paste in households where there are children. The paste, which contains 1.19 per cent elementary phosphorus, is dispensed in a container which does not caution against the danger to children from its careless use. In this case a portion of the paste was ingested by an infant aged 18 months. Fatal phosphorus poisoning followed, which was proved chemically and by autopsy.

BONAR, Salt Lake City.

HEALTH AND SCHOLASTIC ATTAINMENT. H. S. DIEHL, Pub. Health Rep. **44**:3041 (Dec. 13) 1929.

The physical defects, habits of living, and economic status of 141 university students who were on probation because of poor scholarship were compared with the same conditions in 496 students in the same college who were doing satisfactory scholastic work. The predominating defects in the probation group were underweight, asthenia, adiposity and faulty posture. Others which appeared to be of significance were defective hearing, overweight, flabby musculature and anemia. Smoking, excessive use of tobacco or total abstinence showed no statistical difference. In the history obtained by a questionnaire it was found that the probation group had a preponderance of men who were self-supporting, were employed during the summer, were self-conscious, or felt bothered if they were watched by others.

SANFORD, Chicago.

THE LEGAL PHASES OF MILK CONTROL. J. A. TOBEY, Pub. Health Rep. **44**:3110 (Dec. 20) 1929.

The author gives a brief review of the legal phases of milk control, with case references. The courts have been and continue to be liberal by upholding all reasonable regulation of foods by public authorities.

SANFORD, Chicago.

IRRADIATION AND HEALTH. D. COLEBROOK, Medical Research Council Rep., no. 131, 1929.

In a group of 287 secondary school children, 101 were irradiated with a carbon arc lamp, 94 were irradiated with a similar lamp from which rays shorter than 3,200 Angström units were cut off by window glass, and a control group of 92

children received no irradiation. The subjective impressions of the medical officer were indefinite; the balance of opinion among the parents was in favor of the unscreened lamp group, and among the teachers, both lamp groups. The screened lamp group took first place. In many of the results, whether obtained by observation or measurement, or from subjective impressions, the numerical differences are small; in no case are they large enough to signify either a harmful or a beneficial influence in either type of irradiation.

SANFORD, Chicago.

INFANTICIDES BEFORE THE INFANTS HAVE BREATHED. M. E. SOREL, Ann. de méd lég. **8**:515, 1928.

There are many reports of infants killed by a kick or blow on the head, strangulation or even decapitation before they had a chance to breathe and with only the head born. As a consequence, pulmonary docimasia, tests to determine whether the child has breathed or not, although very important, are by no means final in deciding whether infants are born alive. Sorel reports two cases of live birth, one of them first known when the mother confessed having killed the infant before it made a noise, by wounding the hard palate with a finger or fingers in the mouth when she suffocated the infant. The other infant was strangled with a strip of ticking and there were hemorrhages in the outer layers of the wall of the left carotid artery where the cord had bruised the vessel. Thorough examinations in various ways failed to disclose any evidence of aeration of the lungs of either child.

LECOUNT, Chicago.

INFANTICIDES IN EUROPEAN RUSSIA. N. W. POPOFF, Ann. de méd. lég. **8**:532, 1928.

This is a detailed account full of statistics of the increase of abortions, infanticides and deaths of the mothers from puerperal sepsis in Warsaw in the eight years between 1918 and 1925, also of the apathy of the public and the leniency of the law regarding them. Based on the numbers of abortions in Paris before the war, 50,000 each year for 3,000,000 inhabitants, and those in Lyon at that time, 10,000 a year for a population of 500,000, the number in Warsaw is said to be at least 15,000 for its population of 1,000,000. Calculations from other sources place the abortions in Warsaw as 1 for every 5 pregnancies. The ratio to births for four years is as follows:

Year	Births	Abortions
1921	21,710	4,991
1922	22,980	5,285
1923	22,701	5,451
1924	21,157	4,866

Estimates made from the number of women treated in hospitals for the complications following abortions, the number of postmortem examinations and court statistics all were found corroborative of the increase of abortions and of infanticides.

At the Medico-Legal Institute in Warsaw in these years, from 1921 to 1925, 1,043 bodies of infants born at term or prematurely were examined, 483 stillborn and of these only 13 per cent at term; 142 infanticides or deaths from violence and of these 85 infanticides by asphyxia in one way or another. There were 20 bodies of infants born at term in which cranial fractures were found; 48 were born at term and died solely from lack of proper care at that time, and 117 were nonviable, etc.

During the years from 1918 to 1925, examining magistrates inquired into 141 cases of infanticide. In 47.7 per cent the women were acquitted; in 18.5 per cent condemned, but frequently with a reprieve; in 35.7 per cent the accused was condemned for failure to bury the body of the fetus or infant. Among cases tried for abortion from 1920 to 1924 inclusive, the mothers were implicated in 45 and of these women 16 were convicted and 29 set free. There were 51 midwives

tried during this same period and 16 were convicted. In higher courts, of 118 who were tried for abortion, 58 were convicted. The deaths of mothers from abortion and its sequences rose steadily from 18 in 1921 to 43 in 1926. Popoff, Professor of Legal Medicine in Smolensk, reckons that the increase in infanticide, defined in Russia as murder of the infant by the mother at the time of birth, increased from 2.7 per ten thousand births in 1909 to 6.7 in 1925, the total number being 376 in 1909 and 1,120 in 1925. For the years from 1913 to 1919 inclusive, information is not available.

LECOUNT, Chicago.

INFANTICIDES AND ABORTIONS IN WARSAW SINCE THE WORLD WAR. W. GRZYWO-DABROWSKI, Ann. de méd. lég. **8**:545, 1928.

ASSAULT WITH LIGATION OF THE PENIS. P. MULLER, Ann. de méd. lég. **8**:620, 1928.

A boy, aged 8 years, fearing punishment, managed to keep secret his ligated penis until after departure of his father the next morning, when it was discovered by his mother. It was necessary to call a surgeon to sever the cord deeply buried in the penetrated base of the prepuce. The scrotum and loose tissues about the bladder were infiltrated with urine of which a large amount escaped when the cord was cut. Gangrene for 4 by 7 cm. of the scrotum followed, but about three months later the parts were normal.

The boy accused two other boys of attacking him, one of 12 holding him down while the other, about his own age, tied his penis. This the boys denied and they were released from custody. The case was then carried to a higher court, and in spite of an opinion given by Muller that the boy could not have tied his penis in the way it was found, they were again released. The report illustrates the difficulty of legal dealings with children. In discussing this, Brisard told of complete severance of the urethra from a ligature of the base of the penis of a boy of 7 or 8 years which the boy himself applied.

LECOUNT, Chicago.

OPEN AIR AND SUNSHINE SCHOOLS. P. F. ARMAND-DELILLE, Paris méd. **21**: 97 (Aug. 3) 1929.

The author gives a brief history of the development of fresh air schools in France. He believes that they are of the utmost importance in both physical and mental development. A list of the principal fresh air schools is given.

SANFORD, Chicago.

HEIGHT IN INFANCY AND CHILDHOOD. NOBÉCOURT, Progrès méd. **44**:1773 (Oct. 26) 1929.

Nobécourt deplores the tendency to place children for comparison in groups based on the age-height tables. He insists that complete measurements should be compared, as well as a thorough study of the child. Overgrowths that are compared in this way will fall into two groups of statural hypertrophy: (1) physiologic and (2) pathologic. These must be distinguished, as the treatment and prognosis are different in each case.

SANFORD, Chicago.

FACTORS JEOPARDIZING THE MORALS OF YOUTH IN THE LARGER GERMAN CITIES. J. EHRHARDT, Rev. internat. de l'enf. **8**:796 (Nov.-Dec.) 1929.

In the gigantic rearrangement of business and social life brought about by the war in Europe, the children appear to have suffered most. Home conditions have changed, family life is broken for many, and a cynical outlook has replaced the refreshing camaraderie of the antebellum period. In confirmation of this, the author calls attention to the fact that while there were 13,800 divorces annually in Germany for the years 1911 to 1915, there were 36,499 in 1927.

Another outstanding menace to the continuity of family life is unemployment. In 1926, Germany had nearly 2,000,000 persons out of work, of whom about 275,000 were minors. The housing problem is also a factor contributing to national unrest; it is claimed that Germany lacks 750,000 dwellings. In the great cities, only one child in five has a separate bed; of 4,420 children in a single town, 11 per cent live in the same room and over 4 per cent share the same bed with a consumptive. The risk of infection, physical and moral is apparent. Practically all school children suffer from malnutrition, and a considerable percentage from rickets; in Prussia 58,612 cases of the latter were found among 1,351,451 pupils. Many children attend school regularly without breakfast. In Dresden there were 900 pupils unable to attend school on account of insufficient food and clothing.

These handicaps combine to produce a serious outlook for the youth of Germany, but happily a great part of the misery and discouragement is neutralized by the various organizations springing up everywhere and dedicating their energies to amelioration through outdoor activities, such as walking clubs, singing societies and turnvereins.

It is interesting to note that the writer, in speaking of juvenile delinquency which has so markedly increased during the past decade, does not find the moving picture theater or immoral literature of major importance. Rather he blames the cheap entertainments, such as those given at country fairs, and the natural tendency of unrestrained boys and girls to group themselves into robber bands. The value of international conferences on these vital problems is suitably stressed.

AMESSE, Denver.

SCHOOL HYGIENE IN COLOMBIA. ALEJANDRO HERRERA RESTREPO, Bol. Inst. internac am. de protec. inf. **3**:154 (Oct.) 1929.

In spite of hygienically defective premises, the school medical service has endeavored to instil proper ideas of hygiene by lectures to children and teachers and by individual examination of children. The backward children are sent to a special school. School canteens have been established to provide for improvement in poorly nourished children. Of the 33,000 children, over 5,000 were infected with hookworm. This report comes from the province of Cundinamarca the capital of which is Bogota.

LESLIE, Evanston, Ill.

SCHOOL HYGIENE IN COLOMBIA. LUIS CADAVID, Bol. Inst. internac. am. de protec. inf. **3**:184 (Oct.) 1929.

The second report, belonging to a doctor of Medellin, a city which by reason of its altitude has a warmer climate than Bogota, is striking on account of the stress it lays on the children's individual cleanliness, and on the fact of all the schools having bath fittings, which is not common in other countries. Referring to one of the schools that were visited, he says that "the sanitary conditions were excellent, to such an extent that if the height-weight growth of these girls be compared to that of the Paris school children, we should find great advantage in ours."

ABSTRACT OF AUTHOR'S SUMMARY.

JUVENILE DELINQUENCY IN COLOMBIA AND THE PROPHYLAXIS OF CRIME. JORGE BEJARANO, Bol. Inst. internac. am. de protec. inf. **3**:262 (Oct.) 1929.

The writer is professor of hygiene at Bogota and for many years has been interested in the question of delinquency. He presents a detailed study of crime and its prophylaxis, referring to mental prophylactic centers, the Parisian social service for children in moral danger, the work in Hungary and Switzerland centering in the placing of delinquent children in decent families and the Juvenile Court work in the United States. He describes the procedure in Paiba Jail (Bogota) where 16,560 children have been committed in twenty-three years, some

children being committed as many as twelve different times. Factors that contribute to child delinquency are congenital syphilis, tuberculosis, alcoholism and glandular disturbances. A lively imagination is also an important element in juvenile crime.

LESLIE, Evanston, Ill.

CHILDREN PROTECTED BY THE DEMASO LARRANGA ASYLUM, MONTEVIDEO, URUGUAY. ROBERTO BERRO, Bol. Inst. internac. am. de protec. inf. **3**:320 (Oct.) 1929.

The asylum looks after 4,499 children between the ages of 3 and 14 years; 83 per cent of these are cared for in foster homes, vacation colonies and professional schools. Last year, 591 children were admitted because of the desertion, illness, imprisonment or death of a parent. The health of the children is good, the morbidity rate being under the average, and the death rate only 0.27 per cent.

LESLIE, Evanston, Ill.

THE RELATION BETWEEN DENTITION AND FEVER. E. HELMERICH, Arch. f. Kinderh. **88**:139 (Aug. 20) 1929.

Helmerich, from data and case reports collected at the University of Wurzburg during the past twelve years, concludes that there is no connection between dentition and fever. He arrives at this conclusion by observing the absence of fever in many carefully observed infants during teething. The frequency of the two conditions in infants makes them coincidental in many cases.

SANFORD, Chicago.

DURATION OF SLEEP AND ENERGY QUOTIENT OF THE INFANT IN AND OUT OF THE INSTITUTION. GERTRUD PETZOLDT, Monatschr. f. Kinderh. **45**: 193 (Nov.) 1929.

One of the factors that may influence children in institutions unfavorably and lead to an increased requirement of energy is the difference between sleeping conditions in an institution and outside of one. In studying this the author confirmed her suspicion. She found that children sleep much less in a hospital or nursing home than do children encountered in private practice. On the other hand, the physiologic diminution in the length of the sleep period from the beginning to the end of the first year is much less in the institution than in the private home, being six hours in the latter and only two and eight-tenths hours in the former.

Definitely dystrophic children as well as premature infants sleep longer than children with milder nutritional disturbances.

Neuropathic patients show an extremely low period of sleep.

The caloric requirements fitted in well with the studies on sleep, always being higher in the children who slept less.

The writer draws practical conclusions that perhaps one of the factors in the syndrome known as hospitalism may be the problem of sleep.

GERSTLEY, Chicago.

AN AUTOMATIC APPARATUS FOR WARMING MILK BOTTLES. LEOPOLD MOLL, Monatschr. f. Kinderh. **45**:289 (Nov.) 1929.

The author describes an apparatus in which the baby's milk bottles are kept at uniform temperature by an automatically regulated waterbath. The advantages are that the bottles are ready at all times and that the milk is heated uniformly.

GERSTLEY, Chicago.

THE PROBLEM OF CROSS INFECTION IN CHILDREN'S HOSPITALS. RICHARD WAGNER, Ztschr. f. Kinderh. **46**:788 (Dec. 15) 1928.

Wagner describes a plan for a children's hospital in which the wards are not restricted to definite contagious diseases but are for children who have had or are immune to measles or varicella, respectively, and to which they could be admitted without precaution. There would be: (1) a ward with cubicles for patients immune to measles, in which even patients with measles might be admitted; (2) a ward with cubicles for patients immune to varicella which will receive patients with varicella; (3) a ward with cubicles for children who have had neither measles nor varicella; (4) an infant's ward with Pirquet cubicles; (5) a ward with closed cubicles for all contagious diseases except measles and varicella, and (6) an open-air ward on the roof for tuberculosis; part for open, and part for closed cases. In the event that scarlet fever or mumps arises, children with such diseases are taken care of in separate rooms, also provided with cubicles. By this scheme, treatment is given in noncontagious and contagious cases, side by side. To lighten the load on the physicians and nurses, the patients with noncontagious cases are visited first, and those with contagious cases are visited with strict observance of technic. Moreover, children who do not need to stay in bed are not necessarily kept there. In all the remaining contagious cases treatment is given in cubicles, and measles convalescent serum is used generously. Passive immunization against diphtheria is the best prophylactic measure for institutions to provide for newly admitted children. The parents must be required to sign an agreement, in relation to an epidemic of contagious diseases, analogous to the ones demanded by surgeons; that is, the plan is explained to them and they know beforehand that their children may be placed next to a patient having a different contagious disease.

To combat nonspecific infections, the following recommendations are made: (*a*) continued exposure to ultraviolet rays during the winter months, (*b*) isolation of children in cubicles or small, individual rooms, (*c*) masks for adults infected with grip, (*d*) the closing of a ward in which there is grip, even to newly admitted children free from grip, (*e*) Pirquet cubicles in the infants' wards and (*f*) the avoidance of excessive transferring within the institution.

Wagner offers a grouping of contagious diseases according to their contagiousness. 1. Greatest contagiousness—measles, German measles and chickenpox. Infection is borne to great distances through the air and even through open doors and windows. 2. Lesser contagiousness—grip, whooping cough, infantile paralysis and, perhaps, epidemic spinal meningitis. As a chronic infectious disease, tuberculosis belongs here. Contagion is borne likewise through the air, but only by droplets and not easily as in the first group. 3. Least contagiousness—diphtheria, scarlet fever, typhus, dysentery and probably mumps. For contagion, direct or indirect contact is necessary. 4. Isolation of cases in group 1; separate wards with separate entrances and separate ventilation are recommended. The windows must not open into any other department of the hospital. In group 2, there must be isolation in closed cubicles, and in Pirquet cubicles in infants' wards; in group 3, modified cubicles or bedside isolation should be used. Children's rooms for skin, ear and eye departments are not favored as they are especially dangerous for the spreading of grip; only the children's room for surgical cases has any justification. Even lecture rooms, which mean contact with students and transfer from one place to the other, favor the occurrence of house infections. It seems to Wagner that patients should be treated in the wards only when it is unquestionable that they will receive better care than at home. These include cases of laryngeal diphtheria with symptoms of cyanosis, all the internal diseases which need thorough treatment by the physician, such as open tuberculosis with pneumothorax, a majority of the disturbances of nutrition in infants, and diseases that require specific dietary supervision, such as diabetes, infantilism and nephritis.

EMERSON, Boston.

Society Transactions

CHICAGO PEDIATRIC SOCIETY

Regular Meeting, Dec. 17, 1929

A. H. Parmelee, M.D., *President, Presiding*

Diseases of the Ear in Childhood. Dr. George E. Shambaugh.

Every period of life, childhood, middle and old age, has its own peculiar type of ear trouble. In old age this is progressive nerve deafness; in middle life it is progressive obstructive deafness, and in childhood it is the tubotympanic process, ranging from obstructed ventilation to the middle ear, a swelling of the tube, with an exudate in the tympanum, to suppurative otitis media.

The danger to the hearing from the diseases of the ear occurring during childhood is not the chief menace. The defects caused by the tubal catarrhal process usually disappear spontaneously. None of these processes in childhood predisposes to the development of that progressive deafness which constitutes a serious menace to the hearing of adults. The reasons for the frequency of the processes of the middle ear in young children include the susceptibility to infection in the respiratory passage, the presence of adenoids and the acute infectious fevers. The serious menace to the ears in the acute infectious fevers is not, however, in the occurrence of otitis media, but in a toxic neuritis which develops much more frequently when there has been no infection of the middle ear.

Otitis media in an infant differs from the process in adults chiefly because of the difference in anatomic conditions. The infant has no mastoid process and no pneumatic cells. The antrum and tympanum are practically one cavity, and the petrosquamosal suture passes through the outer wall of the antrum and the tegmen which separates the middle ear from the middle fossa.

Alterations back of the ear in otitis media do not have the same significance as when they occur in adults. Drainage through the perforation of the drum membrane is more likely to be all-sufficient for an otitis media in young children.

Indications for Paracentesis and Other Considerations in the Treatment of Acute Infections of the Middle Ear in Children from the Standpoint of the Otolaryngologist. Dr. John J. Theobald.

Indication for paracentesis exists whenever there is an acute inflammation of the tympanic cavity, producing an exudate resulting in a red bulging drum, pain and elevation of temperature. This clinical entity rarely permits any compromising form of treatment, but calls for prompt, free incision of the drum membrane. Experience proves that early incision lessens the duration of the disease, shortens the period of suffering and is the most reliable means of preventing mastoid or other complications.

Otitis media in the severe cases of scarlet fever and measles is worthy of special mention in the consideration of early paracentesis, because of the frequency of mastoiditis and chronic otorrhea. Paracentesis should be done whenever definite signs of tympanic inflammation are present, even though bulging of the drum is not always observed. While the chief concern is to deal properly with the immediate acute situation, one must also be influenced by the future aspect, namely, hearing. Since the symptoms in the ear may be masked by the general symptoms, daily observation of the drums is necessary.

Palliative treatment has its place in most children suffering with earache who have a reddened drum, intermittent pain and a varying temperature, which may be high in a child. This clinical picture, diagnosed tubotympanic catarrh or acute catarrhal otitis media, when it is not the forerunner of the acute suppurative form, often resolves spontaneously. There are exceptions, and these should be guarded against by the observer, who should not be satisfied alone with the subsidence of the pain and fever, but should also concern himself with the return of hearing to normal. The hearing acuity may remain impaired due to the presence of unresolved exudate in the middle ear which, if untreated, may become organized and result in chronic catarrhal otitis media. In the failure of other forms of treatment, paracentesis must be done in this type of disease of the middle ear. Infection caused by *Streptococcus mucosus capsulatus* simulates the catarrhal type. An initial inflammatory stage is followed by a short period of sticky mucoid discharge, and later by the interval or catarrhal period which lasts from weeks to months. Finally, the period of complication may appear unless the organism has been recognized and repeated roentgen therapy given for the mastoid.

Paracentesis is indicated in insufficient spontaneous ruptures with pulsating discharge and pain, also in the "pin prick" type of paracentesis when the same condition exists. Tenderness of the mastoid may subside and surgical measures may be avoided, or a long drawn out period of discharge shortened by this procedure.

The course of myringitis with bleb formation, rarely seen excepting during epidemics of influenza, is often promptly aborted by incision through the outer epidermal layer.

Good results are observed following paracentesis in chronic otorrhea when there is evidence of retention due to an insufficient perforation.

The treatment following paracentesis varies greatly in the hands of different observers. The dry form is preferred rather than frequent syringing with boric solution, but when the discharge is thick, syringing twice daily is recommended. It is of the utmost importance that the patient be at rest in bed and the temperature taken twice daily. Heat applied to the mastoid when tender is of benefit. Early tenderness of the mastoid should not alarm the observer if there is good drainage, as most of the patients in these cases recover. Politzerization, after the acute period, hastens recovery. When this fails to produce a dry ear, the nasopharyngeal condition should be investigated.

ACUTE INFECTIONS OF THE MIDDLE EAR IN INFANTS AND IN YOUNG CHILDREN FROM THE STANDPOINT OF THE PEDIATRICIAN. DR. JOSEPH BRENNEMAN.

There is a pediatric and an otologic ear. The pediatrician sees the ear from the beginning, watches and treats it, and always has in mind the necessity only of calling in an otologist in the minority of cases. The pediatrician is practically more familiar with the ear at this stage than is the otologist, simply because of mass experience. The pediatrician's part, then, is to evaluate the condition, to make an accurate diagnosis and to institute an alleviating treatment; second, to decide whether, and if so, when, to call in an otologist; third, whom to call—in this he is naturally guided by what he knows of the given otologist's method of treatment; and fourth to cooperate with the otologist if fever persists after surgical intervention, especially by excluding extra-aural conditions. In the diagnosis, crying out every few minutes at night or pain in the recumbent position with relief in the upright position is a most important symptom; the otoscopic examination, alone, is decisive, however. The use of phenol and glycerin is almost specific in relieving pain; it may do more. A bulging ear drum with loss of landmarks, especially with disappearance of the short process, usually requires paracentesis, and especially if there is tenderness of the mastoid. Tenderness of the mastoid early in a case of running ear needs watching; late tenderness, especially if accompanied by swelling, redness and edema, an otologist. Simple but ample paracentesis, with insertion of cotton pledgets, is all that is necessary in the great majority of cases. Irrigation, tamponing, antiseptic instillation and meticulous cleansing are rarely necessary and therefore to be avoided in treating a child. Pain,

especially repeated pain, is always to be avoided if possible in the treatment of a child; and when it is necessary, the child, if old enough, should be honestly forewarned. Anesthesia is not recommended for infants, or for older children, except in certain cases of nervousness.

DISCUSSION

DR. J. HOLINGER: I wish to add a word to what Dr. Brenneman said about the sagging of the posterior upper wall. Evidently he has seen the condition and has described it without knowing the technical expression. When the short process of the mallet has disappeared, the posterior upper margin of the membrane has disappeared because the roof of the canal covers them up; that is what we call sagging of the posterior wall.

Bezold states that there is not a person alive who has not had otitis media at some time, often repeatedly. There are different types. In some cases of otitis media the condition is over within half an hour or a night; in others the patients cannot be treated successfully no matter what is done. One sometimes hears that a brain abscess or a meningitis has been avoided by an early paracentesis. I say that these physicians do not know the pathology of the mastoid. In one case Dr. Schott called me to see a patient and insisted on operation earlier than I would have done it, but at operation the "acute otitis" was found to have been from the start an abscess in the neighborhood of the sinus, as there was a deficiency or a dehescence in the bony wall. The inflamed middle ear bordered right on the sinus, and from the start there had been a sinus thrombosis. In several cases that proved to be fatal, a paracentesis was performed several minutes after the onset of the otitis.

There is no question but that many of these cases of otitis are recurrent. If one makes it a rule to do a paracentesis each time, the membrane will become scarred and shriveled. I agree with the essayist that there should not be too much haste about doing a paracentesis. Injury to the foot-plate of the stapes occurs frequently. The consequences are invariably fatal. I have seen many cases in which careful, slight inflation of the middle ear and an icebag on the ear gave complete relief in a short time. A paracentesis is neither an easy nor an innocent affair in a restless child.

Regarding the phenolated glycerin, hemorrhagic nephritis has been reported several times following its use, and I am therefore a little critical about it.

DR. G. W. BOOT: With the great bulk of what has been said I am in thorough agreement, but there are two or three points on which I cannot agree. What Dr. Holinger said about paracentesis not being a life-saving measure is true. The only necessity for it is to permit the exit of some infectious material. The drum membrane is thin, and material cannot accumulate behind it to any great extent without its bulging. When this occurs a paracentesis should be done.

Regarding carbolated glycerin, I have seen several cases in which the membrane of the canal became much irritated following its use, and I think it is not wise to use it recklessly.

In regard to meningitis, the upper part of the middle ear is filled by the body of the malleus, the short process of the incus, and various folds of mucous membrane, and drainage is not so free as it might be. I can see how the infection can just as easily spread upward and involve the meninges as to spread outward and involve the periosteum, and I think this not infrequently occurs. I think the case with 3,000 cells of which Dr. Brenneman spoke was nothing but a meningitis, even though the organism was not found. There need not be an actual bacterial invasion of the dura before it is stated that the condition is potentially a brain abscess and an operation should be performed. I have recently had three patients with brain abscesses at the Children's Hospital. None developed signs of otitis until the brain abscess developed. In one case the abscess extended inward as far as the foramen magnum. I operated on the mastoid, and if there had been nothing else, I would have felt that the operation was not justified, but because of the symptoms of cerebellar abscess I went further and drained the abscess, and the

child recovered. Another case was that of a child with pain and slight tenderness behind the right auricle. He was found to be a diphtheria carrier and was placed in quarantine. He finally developed slight signs of brain abscess, the first symptom being a sudden slight drop in the pulse rate early in the morning. It dropped from about 90 to 62 without any change in the temperature. At noon he had a left-sided convulsion. The right ear had a slight discharge. The convulsion began in the left arm, extended to the leg and became general. On examination I said there was some swelling of the optic disk, but another otologist said he did not think so. There was slight weakness in the tongue, and one physician thought he detected a slight difference in the grip of the hands. There was a positive Babinski sign, and lumbar puncture disclosed 150 cells. We operated and found only a drop of pus at the tip of the mastoid. I went further and explored the brain and let out nearly an ounce of pus from the right temporosphenoidal lobe. Culture medium from the pus evidenced *Bacillus diphtheriae* associated with a streptococcus. A friend of mine in Indiana had said for years that if one does a paracentesis early, the patient will never develop mastoiditis. Finally he had a case in which he did an early paracentesis and the patient developed a severe mastoiditis. It is the same now as in the days of Hippocrates—"Art is long and life is short; experience fallacious and judgment difficult."

DR. M. H. COTTLE: Most of the things I have found in my investigations have been known for a long time and have been mentioned this evening. I have seen one or two instances in which the antrum was definitely blocked by granulation tissue and separated from the middle ear. In one other case in a child about 8 months old, we found a large tip cell which we had almost overlooked. This cell contained pus. These two experiences have put more emphasis for me on the fact that in infancy we have to individualize all cases. In an older child who showed the Gradenigo syndrome, we found at necropsy a definitely open squamous, petrous suture which extended in the direction of the dural abscess.

I did not understand Dr. Theobald's criticism about the use of the electric otoscope. To me this is of great value in the examination of ears in infancy. I think there is frequently a mistake in interpreting observations in young children. When one notes bulging in young infants, one insists that it is near to the posterior superior quadrant, because this segment is most lateral. Alexander says that the drum of the infant is more resistant than that of adults. He also says that sometimes in infants it is difficult to have enough pus in the cavity to produce bulging because of the myxomatous folds of tissue which make many smaller spaces of the middle ear. An isolated space may be the source of infection; it may persist for some time and may produce all the symptoms.

Another point is that in children and adults the planes of the middle ear and of the eustachian tube are not on the same level, while in infancy they are more nearly so.

I agree with Dr. Brenneman in regard to private and hospital practice, because in the hospital the child lies for a great length of time on its back, instead of being picked up and held over the shoulder.

DR. FRANCIS L. LEDERER: One is often at a disadvantage in being an essayist, as the time is limited and therefore omissions are frequent. There have been, however, several outstanding things mentioned by the previous speakers, some of which are facts but others are fancies. One author recommends conservatism and another radicalism, and each may qualify his belief by his own clinical experience. There can be nothing universal; principles are only props for the infirm.

First, as Dr. Brenneman mentioned, the relationship between the otologist and the pediatrician is of tremendous importance economicaly, and one can say only that in order to make the otologist function in a practical way, he must make his services feasible from a practical and economic point of view if he expects to be called in as a consultant. As to who should open the drum, my feeling is that the one who is qualified should do so, whether he is pediatrician or general practitioner. When indicated, by all means the drum should be opened.

Another important item in this relationship is the matter of shifting the responsibility in the conduct of a given case by trying to account for the elevation

of temperature by blaming a central pneumonia or another focus. One must feel confidence, from an otological standpoint, that once drainage is established, the temperature should come down, but pertaining to the latter factor, watchful expectancy is desirable. Furthermore, there is no good reason why two infections could not be concomitant.

If any discussion on otitis media is to be undertaken, one should qualify it either as infants' or children's otitis, because they are separate entities, due mainly to anatomic variations which Alexander (Vienna) has often called to our attention. Therefore, what has been so interchangeably discussed tonight by many of my otological colleagues, must be better qualified on this basis.

If I am not mistaken, Dr. Brenneman's reference to a "pediatric" ear is what we term an otitis media simplex and surely must be differentiated from the otitis media of the suppurative character. The former is perhaps the one that has given the physician such excellent results with the phenolized glycerin mixture, but in the latter, one must recognize the limitations of abortive measures because there is practically no absorption from a hyperemic drum membrane, and if any good is derived, it comes from the warmth of the instilled drops. It is as essential for an otologist to cleanse thoroughly a canal for a study of the drum picture, as it is for a pediatrician to percuss and auscultate a chest in order to diagnose pleurisy, or to examine the urine to make a diagnosis of renal disease. The examination of the child's ear, so important in diagnosis, has its natural difficulties, but these, I believe, are often due to the exaggerated image of an electrically lighted otoscope. While I realize the universal acceptance of the otoscope and its relative merits, I cannot help referring to the use of the head mirror as a more accurate measure for interpreting changes in the drum.

It is interesting to note that in Dr. Brenneman's many years of experience as a pediatrician he has seen only two diseased mastoids. He has to bear in mind, however, that his patients might have had diseased mastoids that were overlooked or that they consulted some one else. I say this merely because the internists have pointed out this possibility to me whenever I chance to say that I have never had a case of lung abscess following tonsillectomy.

I would, for emphasis, reiterate what Dr. Theobald has said, that in prompt and energetic treatment lies the hope of the prevention of mastoid disease and its sequelae. Such treatment should be based on the sound surgical principle of prompt and free release of tension. In a comparatively few cases seen and thus relieved sufficiently, has the need for mastoidectomy arisen. It is true that in a considerable number of cases the abscess will rupture spontaneously and clear up without any complications, but it is also true that the majority of patients operated on are those in whom drainage was not established early.

The question of the relation of cholera infantum to the infant's mastoid that has been mentioned is a fashion of the past. It was one of the literary fashions of the 1927-1928 period, but it has gradually lost its many supporters because of unwarranted interventions and claims, as we find the ear not an important etiologic factor.

It is important not to look on an inflammation of the middle ear as a commonplace infection; not to traumatize an ear with "ear spoons" in removing cerumen nor to fill the canal with so-called antiseptics and analgesics because it is not a receptacle for rubbish; not to depend on this thick, elastic drum membrane to rupture itself as it incurs a responsibility for serious complications. Do not dread paracentesis, myringotomy or incision of the drum surgically and antiseptically. Dr. Holinger's report of a meningitis following paracentesis was a case in which the procedure resulted in subluxating the stapes and should have been treated palliatively rather than by immediate surgical intervention. One should not transgress in the opposite direction of doing too much, of opening every pink drum one sees, or doing repeated paracentesis and constantly traumatizing the canal and drum. While we have certain indications for paracentesis, they certainly may be deviated from when the physician is in doubt. Let it be understood that I would rather open a drum too early than too late, when pus in the middle ear indicates

pus in the surroundings. The middle ear cannot be thought of in the category of an abscess for which one waits until it "comes to a head."

I recommend dry treatment with the use of capillary suction as a means of cleansing the canal and then inserting a wick of dry gauze. I avoid irritation of the skin by protecting it against the discharge and the heat. As to whether to use heat or cold, some physicians believe that cold should not be used as it chills and that chilling tends to increase congestion, thereby retarding drainage. We must of necessity keep the patient in bed and medicate the nose and throat as well as watch the general elimination.

DR. JESSE R. GERSTLEY: It was about 1909 that the infant's ear was discovered. In 1914, I had an unusual opportunity in that I not only was on the staff of the Children's Hospital but was also conducting an infant welfare station. The importance of infections of the ear was pretty thoroughly recognized, and the opportunity presented itself to contrast patients in the hospital with those treated at the infant welfare station. At the station mothers would bring their babies, saying that the child had cried for a few hours and now had a discharging ear. Under appropriate treatment, that is, with little interference, these children made perfect recoveries. At the hospital the enthusiasm of the otologist led him to open every drum that was slightly pink. There is no question that the infants in the hospital developed more complications and did not do as well in any way as those seen at the infant welfare station. This experience over a number of years has led me to be conservative.

I should like to ask the otologists present whether they believe that too early incision of the drum is in any way dangerous.

DR. C. A. ALDRICH: I worked for ten years in private practice without seeing a case of mastoiditis in which operation had been performed and thought this was due to my care and my calling in an otologist at the right time. Then in one month I had three children with mastoiditis requiring operation. I agree with Dr. Brenneman that an otitis media does not need to be opened within the first few hours. The most serious case I have seen was one in which the ear was opened within six hours of the onset of symptoms. That ear was opened several times within the first six or seven days, before I saw the patient. When the fatal termination came, I thought it possibly due to the unnecessary and repeated early openings of the ear drum. One cannot be sure but that it was due to the virulence of the invading organism.

I have been much interested in finding some concrete indication which would make me feel that the ear should be opened and have felt that bulging, pain and elevation of temperature do not always indicate paracentesis. One needs some definite sign as a guide. To me, one of the most valuable aids in this regard has been tenderness to pressure. When occlusion of the opening in the external canal produces definite pain and if this sign is combined with fever and bulging of the drum membrane which has persisted for several hours, I feel fairly confident in advising paracentesis.

DR. H. E. IRISH: Necropsies are illuminating with respect to otitis media and infection. We have seen a number of necropsies in brain abscesses and sinus infections in which it has been demonstrated that the infection involved the eustachian tubes and the middle ear and passed directly through into the meninges, without at any time giving any appearance in the drum significant of underlying infection.

Another point was mentioned as to whether a case was a central pneumonia or an otitis media. It is well for us all to remember that pneumonia and otitis media can exist contemporaneously. I have seen several of these cases in which the ear would rupture spontaneously on or near the day of crisis of the pneumonia, indicating that the same organism which produced the pneumonia was responsible for the ear infection.

In the cases in which the baby's ear is filled with wax and an attempt to remove the wax brings about a flow of blood which obscures the whole picture,

the diagnosis is often helped by traction on or pressure of the soft parts. We used to call these cases para-otitis. There is involvement of the ear canal with edema over the mastoid, sometimes sufficient to push the auricle forward. Those cases do not need opening. When my own boy had such a condition, an otologist said it did not need opening and I took his word, and the whole thing cleared up without surgical intervention. The invasion of the anatomic structures about the drum which we pediatricians see often makes the canal so edematous that it is practically closed, and yet they clear up nicely under treatment with glycerite of phenol and heat.

DR. J. H. WALLACE: I should like to ask Dr. Shambaugh and Dr. Theobald what eventually happens to these ears that have chronic drum perforations following suppurative otitis media. Do these eventually heal spontaneously? What happens to them in adult life? And do they predispose to permanent deafness later on?

DR. GEORGE E. SHAMBAUGH: I enjoyed this discussion, and I could not help feeling as I listened to Dr. Brenneman's remarks that if undergraduate medical students learned their otology from him, infants might be better off than when the students get their knowledge entirely from the otological specialist.

This autumn I have seen two children with swellings back of the ear developing in the course of an acute otitis media. Both were sent to me because it was felt that the situation required surgical treatment. Both recovered without operation. As to what happens to children who go through a period of recurring attacks of otitis media sometimes lasting over two or three seasons: What can be done to prevent recurrence of such attacks? Of course, when the situation is complicated by an infection of the tonsils and adenoids, these conditions should be corrected. But, as for the ear condition, the treatment is to keep the ear clean, carry out an occasional inflation, and watch closely enough so that one will recognize the development of any complication which may need attention.

With a few exceptions, these children cease having attacks of ear trouble by the time they reach adolescence. Occasionally, the disease of the middle ear has left some permanent defect in hearing, the result of fixation of the conductive mechanism, but it is rare for any of these conditions to leave a condition of permanent profound deafness. It should be borne in mind, moreover, that these tubotympanic processes of childhood rarely prolong themselves as active processes into adult life and are not a factor in bringing on progressive deafness, otosclerosis, in adults.

The question of when to do a paracentesis is an important one. One of the chief indications has been overlooked in this discussion. The decision to incise a drum membrane often rests on the state of the temperature. When a child has a high temperature which is not accounted for from other sources, and one recognizes a drum membrane which is perhaps only grayish with some obliteration of landmarks, it is proper to carry out a paracentesis. Nothing serious ever results from an unnecessary paracentesis, provided this is not bungled. I am in accord with Dr. Brenneman that emergencies do not arise in acute otitis media which make it urgent and necessary that the incision be done within an hour, or even a day, after onset. Even the milder cases of acute otitis media often begin with rather a violent earache for an hour or two, and then subside and never require an incision of the drum membrane.

The same policy should be pursued in connection with the question of operating for drainage back of the ear. The impression is often held by the general physician that emergencies develop in the course of acute otitis media which necessitate an immediate mastoid operation, similar to the emergencies that occur in appendicitis. I can recall repeated instances in previous years when being called out of the city for twenty-four hours, I came back to find a child that had been under observation had been rushed to the hospital in the middle of the night and operated on. This, of course, was entirely unwarranted. Emergencies do not arise in the course of otitis media when delay of a day or two, or three, might be looked on as procrastination.

As regards the discussion concerning the sagging of the posterior wall as an indication for mastoidectomy, this is not a symptom that belongs to otitis media in infancy. It occurs only in adults, because it is only in adults that the development of the mastoid and the bony external meatus carries with it the placing of the antrum out along the upper posterior wall. In an infant there is no bony meatus, and there can be no sinking of the upper posterior meatus wall.

DR. JOHN THEOBALD: Sagging of the posterior wall was mentioned as significant only in the cases of the patients who were operated on for cholera infantum. I do not depend on this symptom, as the condition in cases with well defined surgical mastoiditis in infants can be diagnosed without this observation.

Regarding the electric otoscope, I was misunderstood. I have acquired one and am learning to use it. I like it particularly for a bedside examination when the lights are inconvenient for reflection purposes.

I am in agreement with Dr. Brenneman in regard to the care of the ear after paracentesis. I rarely see a patient again after doing a paracentesis; the pediatrician looks after the future course of the patients, which, with rare exceptions, is uneventful. My instruction is usually that he shall not syringe the ear unless the discharge happens to be thick, and then it shall not be repeated too frequently. The cases Dr. Brenneman spoke of as the "pediatric ear" are the milder types of infection, and I know that pediatricians see more of these cases than do otologists and that the patients in most of them recover under palliative treatment. The type of case I have in mind that requires paracentesis is the one with severe pain, a red bulging ear drum and fever, the kind of case Dr. Brenneman wants an otologist to see. I do not think that the patient with such a condition should be treated palliatively too long. Delay prolongs the suffering and increases the likelihood of complications. Dr. Brenneman is fortunate in being able to recognize definite bulging and in knowing just when to stop treatment and have the ear drum opened. I think too early paracentesis may result in closure before the process of infection has reached its height, requiring a second incision. I have made few second incisions, and hope I shall never have to make another.

DR. JOSEPH BRENNEMAN: Regarding the question of early paracentesis, I have acquired the habit of delay, but I believe it is a good thing here, as in many other surgical conditions.

In regard to the otoscope, they came into use after I had acquired a few gray hairs, but now I would not part with my electric otoscope for anything.

I think a part of the purpose of this meeting was to give us a little spirited discussion, and therefore I welcome Dr. Lederer's frank remarks. I said in the beginning of my remarks that there is an otological ear and a pediatric ear. To me it is patent that Dr. Lederer is not as familiar with the pediatric ear as we are. He opposes the use of phenol and glycerin on its physiologic action. I do not know whether it is absorbed or not, or what its action is, but when Dr. Lederer has lived as long as I have and has seen as many ears and relieved as many, almost instantaneously, with this procedure he will agree with me.

I said that in private practice I frequently pay no attention, and do not rush to do a paracentesis within the first twelve to twenty-four hours, and I cannot recall an instance in which I could have done any more good by doing it earlier.

With regard to mastoiditis, of which I have said I had seen so few cases in private practice, Dr. Aldrich, who has a large practice, reports that for ten years he had none, then had three cases in one month and has had none since. That covers fourteen years of practice, and I think that is about the incidence in my own practice. To quote statistics from a children's hospital is beside the question, for in infant wards the majority of babies have running ears.

Dr. Lederer's comparison between treating a patient with disease of the ear and one with pleurisy is not exactly to the point. I did not say that one should never clean out an ear, but that it should not be cleaned out meticulously every day simply to see whether the hole is a little larger than it was the day before. It is not advisable to make a child a nervous wreck, which is frequently the result of needless otological treatment.

Book Reviews

THE DIAGNOSIS OF HEALTH. By WILLIAM R. P. EMERSON, M.D. Price, $3. Pp. 272, with illustrations and 51 charts. New York: D. Appleton & Company, 1930.

In the preface to his new book entitled "The Diagnosis of Health," Dr. William R. P. Emerson states his ideas "regarding health status and emphasizes the fact that this status too often remains a matter of opinion rather than the result of scientific investigation."

Dr. Emerson states in Chapter I, that "disease is any departure from health presenting marked symptoms, and health is the absence of disease of a physical type." "Health is a relative term. We can seek to see how well a person is as definitely as we seek to determine how sick he is."

The question might be raised at once, is the mere absence of disease of a physical type the only criterion for the measurement of health? Dr. Emerson states seven signs of physical fitness. If these were to be used in comparing different children, a degree of standardization would be required which has hardly been reached as yet.

In Chapter II, Dr. Emerson outlines his ideas with regard to the satisfactory signs of health.

In the discussion of Chapter III on the essentials of health, the statements are general enough to be acceptable to most physicians.

In Chapter V, Dr. Emerson attempts to answer the question "What should I weigh?" by stating that "an exact standard weight does not exist" and further "this must be done chiefly through inspection and actual experience of the individual regarding the weight at which one feels best and works most efficiently."

In Chapter IV, is a series of figures showing graphically the deformities that are practically constant for both seriously underweight and obese groups. (These are loaned by Davenport and were produced by permission of the Carnegie Institute of Washington.) Here one can readily see the great variations in individual build in a number of males at various ages from 18 to 23.

Franzen (American Child Health Association) has recently conducted a study which also emphasizes the variations in body build.

With Dr. Emerson's statement that " a careful history and a thorough examination are the basis for improvement in the physical condition of the child," very few will disagree but with his emphasis on the significance of the variation in weight and height of an individual from an average figure there are no doubt many who disagree. The items listed in his social examination and his personality examination also will meet with general approval of physicians as will the emphasis to be laid on proper health habits and health information.

The nutrition class seems to provide a regular program for supervision and instruction to mothers of malnourished children. Various devices are used in the work of the nutrition class for maintaining the interest and cooperation of the children and parents. Used as a device, weight changes are valuable in enlisting the child's endeavors to live up to the professional advice given, and the supervision by the physician at periodic intervals, weekly or longer, certainly will aid the child and parent at all times in understanding the progress made by the endeavors to carry out the advice given.

That weight is a complex proposition rather than an entity is shown by the effect following the various causes listed on pages 83 and 84. Losses of several pounds may take place within a few hours and on the same day, and within one or two days be entirely regained, particularly following strenuous exercise which produces a dehydration of the tissue. A loss from such a cause is easily and

quickly remediable. The idea of carrying the nutrition class idea into the college, particularly as regards athletes, seems to be particularly desirable, and appears to be effective as it is conducted at Dartmouth College.

The great stress laid on the dangers of overfatigue and the importance attached to this subject by Dr. Emerson will receive hearty support from many in the medical profession.

The health of the various citizens in a community depends on understanding the basic principles of health maintenance through the practice of proper habits and on their mental attitudes and the opportunities afforded to learn these important facts and observe them in daily practice.

The health of the community will represent the health practices in the home. The home is the important unit in the community, and if we can get health in the home, the health of the community is assured. These facts are very properly and effectively brought out in Dr. Emerson's book.

The very fact that the subject of health is a complex proposition and that many factors enter into its consideration only emphasizes the difficulties involved in standardizing or recording health status. The proper determination of which of the many factors enter into the general consideration of health which are operative in the individual case, are the main points so admirably brought out by the author.

The book will provide food for much discussion on the subject of health and its preservation.

PRÉCIS D'HYGIENE ET DES MALADIES DU NOURRISSON. By WEILL-HALLÉ, BLECHMANN, DORLENCOURT, HALLEZ, LAVERGNE, ROUDINESCO, SALÈS, TURQUETY and PIÈRRE VALLERY-RADOT. Published under the direction of A. B. Marfan and Henry Lemaire. Pp. 1078, with 114 illustrations. Paris: J. B. Baillière et fils, 1930.

The wide scope of this book and the care taken in its preparation are indicated by the subjects covered and by the contributing authors. Marfan writes on the general characteristics of infancy and on the diseases of the bones and joints, including rachitis. Dorlencourt considers the physiology of digestion and nutrition and the therapeutics of infancy. The chapter on infant feeding is by Salès and Rondinesco. Lemaire discusses clinical examination, disturbances of the gastro-intestinal tract and the associated glands together with Weill-Halle disturbances of nutrition, Blechmann diseases of the circulatory system and Turquety and Lavergne diseases of the nervous system. He also has chapters on congenital malformations and general and social hygiene. Radot collaborates with Blechmann in the discussion of syphilis, and contributes chapters on infectious diseases and diseases of the skin. Blechmann and Hallez have chapters on diseases of the respiratory system and of the blood and hematopoietic organs. Hallez discusses the endocrine glands, and Blechmann the organs of sense. Tuberculosis is considered by Turquety, diseases of the genito-urinary system by Lavergne, and the new-born by Salès.

PUBLIC HEALTH ASPECTS OF DENTAL DECAY IN CHILDREN. By RAYMOND FRANZEN. Paper. Price, $1. Pp. 121, with 59 tables. New York: American Child Health Association, 1930.

This is the third monograph in the School Health Research Series, and deals with the analysis of the mouth records of 7,500 children of the fifth and sixth grades, as well as several thousand children of lower ages. The six chapters are divided into the measurable aspects of oral hygiene, the continuity of decay, the effects of fillings on dental decay, the relation of enamel defect to school health policy, stain tartar and gingivitis and the application of the conclusions to the problem of dental influence. In all of these aspects the idea has been to develop a standard for measurement, so that individual comparisons may be formulated into one standard. This will be contributory to the development of an evaluation formula which in the final volume of the series can be applied to each of the school groups that have been studied.

THE MERRILL-PALMER STANDARDS OF PHYSICAL AND MENTAL GROWTH. C. A. WILSON, M. E. SWEENY, R. STUTSMAN, L. R. CHESIRE and E. HATT. Paper. Price, 50 cents. Pp. 121, with 19 figures and 29 tables. Detroit: The Merrill-Palmer School, 1930.

These standards have been made on 265 nursery school children from 2 to 5 years of age. Twenty-nine tables are given of the standing height, weight, weight-height index, stem length, recumbent length, stem-stature index, mental level by the Stanford Revision Test, Merrill-Palmer scale and the Goodenough drawing test, Monroe scale, activity, food intake, lunch time, sleep and cause of absence. The percentage method is used in the tables, which may not be clear at first glance. A method of consolidating these data for individual children, called a biogram, is given.

THE HEALTH AND CARE OF THE BABY. By LOUIS FISHER, M.D. Price, $1. Pp. 247, with 8 illustrations. New York: Funk & Wagnalls Company, 1930.

This is the eighteenth edition of this handbook for mothers and nurses. New parts have been added regarding orthopedics, immunization against diphtheria and ultraviolet therapy. It is unfortunate that some of the older material has not been reedited; such statements as "nervous manifestations such as St. Vitus' dance have been believed to result from nervous shocks during pregnancy" and "boiled milk should not be fed for any length of time" are not exactly convincing.

THE BABY'S FIRST TWO YEARS. By RICHARD M. SMITH. Price, $1.75. Pp. 159, with 7 illustrations. Boston: Houghton Mifflin Company, 1930.

This is the third edition of the book for mothers, and has been brought up to date. It is still divided into three parts: the first deals with the care and feeding of the infant; the second gives advice to mothers, and the third contains standard recipes. This is a book that the physician can safely add to his list as suitable to recommend to mothers.

CORRECT RECIPES FOR CHILDREN'S NUTRITION. By E. ROMINGER and E. LORENZ. Paper. Price, 2 marks. Pp. 58. Berlin: Julius Springer, 1930.

This book contains a collection of recipes of the various forms of milk preparations used in infant feeding, and some dishes for the school and preschool child, from the children's kitchen of the Children's Hospital of the University of Kiel.

THE MEDICAL MUSEUM. By S. H. DAUKES. Pp. 183, with illustrations. London: The Wellcome Foundation Ltd., 1929.

This book contains a description of the Medical Museum by its director. He believes that the Medical Museum should have a wider function in the field of teaching. The book is well printed, and the illustrations of the museum figures are very good.

THE NORMAL DIET. By W. D. SANSUM. Cloth. Price, $1.50. Pp. 134. St. Louis: C. V. Mosby Company, 1930.

The third edition of this popular work has been revised, and special diets for various conditions have been added

WEIGHT TABLE FOR CHILDREN. By J. V. LUKÁCS and A. MEYERSTEIN. Price, 5 marks. Berlin: Paul Altman, 1928.

This publication consists of two folding cardboard tables, with a celloid calculator for caloric requirement.

Directory of Pediatric Societies

INTERNATIONAL

International Pediatric Congress

Prof. I. Jundell, Artillerigatan 23, Stockholm, Sweden.
Place: Stockholm. Time: Aug. 17-20, 1930.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. William Weston, 1231 Bull. St., Columbia, S. C.
Secretary: Dr. C. A. Aldrich, 545 Lincoln Ave., Winnetka, Ill.
Place: Detroit. Time: June 23-27, 1930.

American Child Health Association

President: Hon. Herbert Hoover, 370 7th Ave., New York.
Secretary: Dr. Philip Van Ingen, 370 7th Ave., New York.

American Pediatric Society

President: Dr. Joseph Brennemann, 30 N. Michigan Blvd., Chicago.
Secretary-Treasurer: Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Place: Windsor Hotel, Montreal. Time: June 17-19, 1930.

Association of American Teachers of the Diseases of Children

President: Dr. Lawrence T. Royster, State Board of Health, University, Va.
Secretary: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Place: Detroit. Time: June 24, 1930.

Children's Hospital Association of America

President: Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Secretary-Treasurer: Miss Bena M. Henderson, Milwaukee Children's Hospital, Milwaukee.
Place: New Orleans, La. Time: October, 1930.

Canadian Society for the Study of Diseases of Children

President: Dr. E. A. Morgan, 160 Bloor St., Toronto, Ont.
Secretary-Treasurer: Dr. George E. Smith, 244 Bloor St., W., Toronto, Ont.
Place: Brockville, Ont. Time: June 20-21, 1930.

SECTIONAL

Central States Pediatric Society

President: Dr. Edward Clay Mitchell, 1073 Madison Ave., Memphis, Tenn.
Secretary: Dr. A. H. Parmelee, 310 S. Michigan Blvd., Chicago.
Place: Memphis, Tenn. Time: Fall, 1930.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. H. Leslie Moore, 1717 Pacific Ave., Dallas, Texas.
Secretary: Dr. Ludo von Meysenbug, 3501 Prytania St., New Orleans, La.
Place: Louisville, Ky.: November, 1930.

STATE

Alabama Pediatric Society

President: Dr. J. MacBell, Mobile.
Secretary-Treasurer: Dr. Hughes Kennedy, Jr., Highland Plaza Apts., Birmingham.

Georgia Pediatric Society

President: Dr. W. N. Adkins, Medical Arts Bldg., Atlanta.
Secretary-Treasurer: Dr. E. N. Gleaton, 212 E. Gaston St., Savannah.

Louisiana State Pediatric Society

President: Dr. J. A. Crawford, Lake Charles.
Secretary-Treasurer: Dr. C. T. Williams, 7401 Burthe St., New Orleans.

Oklahoma State Pediatric Society

President: Dr. William M. Taylor, Osler Bldg., Oklahoma City.
Secretary: Dr. Carol Pounders, 110 W. 10th St., Oklahoma City.
Place: Shawnee. Time: May, 1930.

South Carolina Pediatric Society

President: Dr. M. W. Beach, 126 Meeting St., Charleston.
Secretary-Treasurer: Dr. Julian P. Price, The McLeod Infirmary, Florence.

Texas Pediatric Society

President: Dr. H. P. Ledford, 1310 9th St., Wichita.
Secretary-Treasurer: Dr. John G. Young, 3930 McKinney Ave., Dallas.

Virginia Pediatric Society

President: Dr. Franklin D. Wilson, 136 York St., Norfolk.
Secretary: Dr. J. B. Stone, 2042 Park Ave., Richmond.

LOCAL

Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. John Toomey, Cleveland City Hospital, Cleveland.
Secretary: Dr. A. B. Grossman, 7016 Euclid Ave., Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. G. A. Davis, 12 Belsize Drive, Toronto.
Secretary: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Time: November 17, December 15, February 16 and March 15.

Bronx Pediatric Society

President: Dr. David I. Frey, 2065 Grand Concourse, New York.
Secretary: Dr. H. M. Eisenoff, 1018 E. 163rd St., New York.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Second Wednesday of each month, except June, July, August and September.

Brooklyn Pediatric Society

President: Dr. Joseph F. Paulonis, 1357 Bushwick Ave., Brooklyn.
Secretary: Dr. Irwin Schiff, 658 Eastern Parkway, Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

Central New York Pediatric Club

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

Chicago Pediatric Society

President: Dr. Arthur H. Parmelee, 310 S. Michigan Blvd., Chicago.
Secretary: Dr. Bert I. Beverly, 130 S. Oak Park Ave., Oak Park, Ill.
Place: City Club. Time: Third Tuesday of each month.

Detroit Pediatric Society

President: Dr. Wyman C. C. Cole, 2970 W. Grand Blvd., Detroit.
Secretary: Dr. Charles A. Wilson, 71 E. Perry St., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Lee Bivings, Exchange Bldg., Atlanta.
Secretary: Dr. William Kiser, Medical Arts Bldg., Atlanta.
Place: Academy of Medicine, 32 Howard St. Time: Second Thursday of each month from October to April, 8 p. m.

Memphis Pediatric Society

President: Dr. G. J. Levy, 899 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. R. Graves, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. M. G. Peterman, 167 17th St., Milwaukee.
Secretary: Dr. F. R. Janney, 418 E. North Ave., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

Nebraska Pediatric Society

President: Dr. H. B. Hamilton, 434 Aquila Court Bldg., Omaha.
Secretary: Dr. George L. Clark, 1817 Vinton St., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive, 6 p. m.

New England Pediatric Society

President: Dr. Grover F. Powers, New Haven, Conn.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: October, January and March.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. F. Elmer Johnson, 300 West End Ave., New York.
Secretary: Dr. Hugh Chaplin, 39 E. 75th St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

North Pacific Pediatric Society

President: Dr. W. F. Patrick, Medical Arts Bldg., Portland, Ore.
Secretary: Dr. L. Howard Smith, Medical Arts Bldg., Portland, Ore.

Northern California Pediatric Society

President: Dr. Edward B. Shaw, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Lloyd Hardgrave, 384 Post St., San Francisco.
Place: Various teaching schools. Time: Monthly.

Northwestern Pediatric Society

President: Dr. E. S. Platou, 730 La Salle Bldg., Minneapolis.
Secretary: Dr. F. G. Hedenstrom, 218 Lowry Bldg., St. Paul.
Place: University Campus and Rochester, Minn. Time: Winter, Spring, Summer, Fall.

Philadelphia Pediatric Society

President: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Secretary: Dr. John D. Donnelly, 115 Bryn Mawr Ave., Bala-Cynwyd, Pa.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. David H. Boyd, 200, 9th St., Pittsburgh.
Secretary: Dr. Theodore O. Elterich, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. Basil B. Jones, 2618 Grove Ave., Richmond, Va.
Secretary-Treasurer: Dr. John S. Weitzel, 3103 W. Franklin St., Richmond, Va.
Place: Westmoreland Club, 601 E. Grace St. Time: First Thursday of each month (other than during the summer).

Rochester Pediatric Society

President: Dr. John Aikman, 184 Alexander St., Rochester, N. Y.
Secretary: Dr. Howard F. Rowley, 278 Alexander St., Rochester, N. Y.
Place: Arranged by program committee. Time: First Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. Elsie Seelye Pratt, Republic Bldg., Denver.
Secretary-Treasurer: Dr. Wilford W. Barber, Metropolitan Bldg., Denver.
Place: Children's Hospital, Denver. Time: Third Saturday of each month from September to May, inclusive, 2:30 p. m.

St. Louis Pediatric Society

President: Dr. Park J. White, Beaumont Bldg., St. Louis.
Secretary-Treasurer: Dr. Ralph L. Cook, 508 N. Grand Blvd., St. Louis.
Place: St. Louis Children's Hospital. Time: At least once a year and contingent thereafter on the arrangement of a suitable program.

Seattle Pediatric Society

President: Dr. Vernon W. Spickard, Cobb Bldg., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. Ezra S. Fish, Pacific Mutual Bldg., Los Angeles.
Secretary: Dr. Fred L. Glascock, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. W. D. Lyon, 101 S. Balch St., Akron, Ohio.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.
Place: Ann Arbor, Mich. Time: About November 22, 1930.

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CONTENTS

PAGE

The Insensible Perspiration in Infancy and in Childhood: II. Proposed Basal Standards for Infants. Samuel Z. Levine, M.D.; Margaret Kelly, R.N., and James R. Wilson, M.D., New York 917

Antirachitic Effect of Winter Sunshine Through Celo-glass: Results of Experimentation on Rats. Theodore S. Wilder, M.D., Germantown, Pa., and Christine Vack, A.B., Boston 930

Underweight Children: Increased Growth Secured Through the Use of Wheat Germ. Agnes Fay Morgan, Ph.D., and Margaret M. Barry, M.A., Berkeley, Calif.. 935

Five Years' Clinical Experience with Lemon Juice-Milk. Louis H. Barenberg, M.D., and Harold Abramson, M.D., New York, and William H. Messer, M.D., Brooklyn..... 948

Croup: An Analysis of Three Hundred and Forty-Four Cases. D. M. Tolle, M.D., New York..... 954

Antirachitic Value of Winter Sunlight in the Latitude of 42° 21′ (Boston). Edwin T. Wyman, M.D.; Philip Drinker, S.B., Ch.E., and Katherine H. MacKenzie, R.N., Boston 969

Chronic Subdural Hematoma in Infants. David Sherwood, M.D., Boston 980

Case Reports:

The Effect of Pilocarpine in a Case of Sympathicotonia in Childhood. Eugene M. Landis, M.D., and J. C. Gittings, M.D., Philadelphia.....1022

A Safe Safety-Pin. Woodard Colby, M.D., St. Paul.....1031

Pellagra Secondary to Gastro-Intestinal Disease. R. W. B. Ellis, M.B. (Camb.), Boston.....1036

Unilateral Edema: Report of a Case in an Infant Aged Four Months. Jerome S. Leopold, M.D., and Julian L. Rogatz, M.D., New York.....1045

Progress in Pediatrics:

Infant Feeding in England and in France from 1750 to 1800. T. G. H. Drake, M.B., Toronto, Canada.....1049

Diseases of the Ear in Childhood. George E. Shambaugh, M.D., Chicago 1062

Pediatric Biographies:

Robert Whytt. John Ruhräh, M.D., Baltimore.....1068

Correspondence:

Ferry Antimeasles Serum.....1074

News and Comment.....1076

Abstracts from Current Literature.....1077

Society Transactions:

Chicago Pediatric Society.....1138

Book Reviews 1146

Directory of Pediatric Societies.....1149